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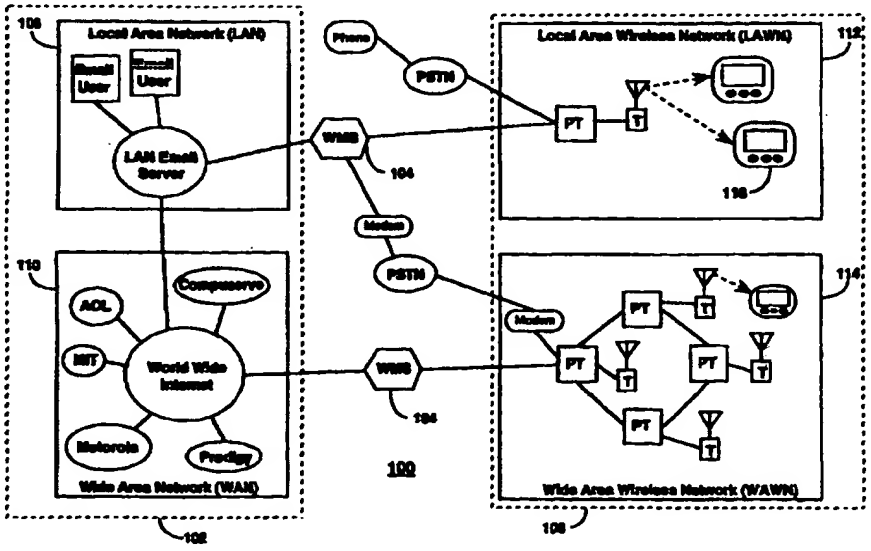

(57) Abstract

A wireless message delivery system includes a wired messaging network (102) which delivers E-mail messages between wired network nodes, and which further inputs E-mail messages for delivery to a wireless messaging unit (116). A wireless messaging server (104) is coupled to the wired messaging network (102), and receives and processes the E-mail messages inputted from the wired messaging network (102) for delivery to the wireless messaging unit (106). A wireless messaging network (106) is coupled to the wireless messaging server (104) and delivers the E-mail messages to the wireless messaging unit.

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WIRELESS MESSAGE DELIVERY SYSTEM

Field of the Invention

The present invention relates generally to the field of message delivery systems, and more particularly to a wireless message delivery system which delivers messages originated from within a wired message delivery system to a wireless messaging unit.

Background of the Invention

Wireless messaging systems, such as conventional radio paging systems have for many years provided message delivery to portable communication receivers, or pagers. In radio paging systems, tone only, voice, numeric, and alphanumeric messages were entered by a message originator using a message entry device such as a telephone for tone only, voice and numeric messages, and a page entry terminal, or personal computer, for alphanumeric messages. Messages inputted from a page entry terminal or a personal computer were routed through a PBX for on-site paging messages, or through the Public Switched Telephone Network (PSTN) for local or wide area paging messages for delivery to a paging terminal which processed the messages for delivery to the portable communication receiver designated by the message originator.

Summary of the Invention

In accordance with one aspect of the present invention, a wireless message delivery system includes a wired messaging network which delivers E-mail messages between wired network nodes, and which further inputs E-mail messages for delivery to a wireless messaging unit. A wireless messaging server is coupled to the wired messaging network, and receives and processes the E-mail messages input from the wired messaging network for delivery to the wireless messaging unit. A wireless messaging network is coupled to the wireless

messaging server and delivers the E-mail messages to the wireless messaging unit.

Brief Description of the Drawings

FIG. 1 is a block diagram of a wireless message delivery system in accordance with the preferred embodiment of the present invention.

FIG. 2 is an electrical block diagram showing the configuration of a wireless messaging server in accordance with the preferred embodiment of the present invention.

FIG. 3 is an electrical block diagram showing memory partitioning within the wireless messaging server in accordance with the preferred embodiment of the present invention.

FIG. 4 is a system software context diagram for the wireless message delivery system in accordance with the preferred embodiment of the present invention.

FIG. 5 is a wireless messaging server software architecture diagram for the wireless message delivery system in accordance with the preferred embodiment of the present invention.

FIG. 6 is a message processor software architecture diagram for the wireless messaging server in accordance with the preferred embodiment of the present invention.

FIG. 7 is a message parsing software architecture diagram for the wireless messaging server in accordance with the preferred embodiment of the present invention.

FIG. 8 is a wireless message dispatch software architecture diagram for the wireless messaging server in accordance with the preferred embodiment of the present invention.

FIG. 9 is a diagram of a typical E-mail message sent from the Wired messaging network **102** in the prior art SMTP E-mail message format.

FIG. 10 is a diagram of an E-mail wireless message using E-mail aliases for addressing a wireless messaging unit in accordance with the preferred embodiment of the present invention.

FIG. 11 is an E-mail context configuration diagram for addressing a wireless messaging unit using E-mail alias addressing in accordance with the preferred embodiment of the present invention.

FIG. 12 is a diagram an E-mail wireless message using sub-domain paging for addressing a wireless messaging unit in accordance with the preferred embodiment of the present invention.

FIG. 13 is an E-mail context configuration diagram or addressing a wireless messaging unit using sub-domain paging in accordance with the preferred embodiment of the present invention.

FIGS. 14 through 20 are flow charts illustrating the operation of the wireless messaging server in accordance with the preferred embodiment of the present invention.

Description Of The Preferred Embodiments

FIG. 1 is a block diagram of a wireless message delivery system **100** in accordance with the preferred embodiment of the present invention. The wireless message delivery system **100** comprises a wired messaging network **102**, a wireless messaging server **104** (two of which are shown by way of example) and a Wireless messaging network **106**. The wired messaging network **102** can include a LAN **108** (local area network), a WAN **110** (wide area network), or a combination of LAN **108** and WAN **110** networks as illustrated. It will be appreciated that while only a single LAN **108** network and a single WAN **110** network are shown, multiple LAN **108** networks and/or WAN **110** networks can be interconnected in a manner well known to one of ordinary skill in the art for the transfer of E-mail messages. The wireless messaging network **106** can include a LAWN **112** (local area wireless network), a WAWN **114** (wide area wireless network), or a combination of LAWN **112** and WAWN **114** networks. It will be appreciated that while only a single LAWN **112** network and a single WAWN **114** network are shown, multiple LAWN **112** networks and/or WAWN **114** networks can be interconnected in a manner well known to one of ordinary skill in the art for the distribution of a wireless message, such as a paging

message, to a wireless messaging unit **116**, such as a pager or an information service receiver.

The general function and operation of a LAN **108** (local area network), shown in FIG. 1, is one of allowing spatially co-located computers which are typically located within a room, building or campus of buildings to share common resources on a computer network in a manner well known to one of ordinary skill in the art. The spatially co-located computers are represented pictorially in FIG. 1 as E-mail users, two of which are shown by example. Typical resources shared on a LAN **108** network are files on a File Server, printers on a Print Server, and E-mail message services on an E-mail server. The LAN **108** network uses a physical network such as ARCNET, Ethernet, Token-ring, Local Talk or other network media to connect the computers which represent wired network nodes into the network. The LAN **108** network can employ any one of a number of networking protocols, such as TCP/IP (Transmission Control Protocol/Internet Protocol), AppleTalk™, IPX/SPX (Inter-Packet Exchange/Sequential Packet Exchange), Net BIOS (Network Basic Input Output System) or any other packet structures to enable the communication between E-mail users and the E-mail server. The LAN **108** can also use routers (not shown) to subnet the LAN **108** network organizationally or physically. In this context, the definition of a LAN **108** network as described herein refers to a geographic locality of computers and the type of wired media used to interconnect the computers for communication.

TCP/IP

The general function and operation of the WAN **110** (wide area network) is also one of allowing computers to share common resources. However, in this context the definition used herein is one where the computers are not spatially co-located. The typical resources shared are similar to, if not the same, as found in a LAN **108** network. However, the WAN **110** network uses a different physical network media such as X.25, Frame Relay, ISDN, Modem dial-up or other media to connect other computers or other local area networks to the WAN **110** network. FIG. 1 shows by way of example a number of well known public and private wide area networks such as Compuserve™, America Online™ (AOL), the MIT computer network,

the Motorola™ computer network and Prodigy™ which are shown by way of example. The WAN **110** network described above can operate independently, or can be interconnected through the well known world wide Internet computer network. Likewise, a LAN **108** network can also be interconnected to a WAN **110** network through the world wide Internet computer network, as shown, in a manner well known to one of ordinary skill in the art.

The general function of the LAWN **112** (Local Area Wireless Network) is one of offering local wireless messaging services, where the term "local" refers to a coverage area provided by a single transmitter on-site wireless messaging system, or a multiple transmitter wireless messaging system which can cover at most a single predetermined metropolitan area. Messages are input into the LAWN **112** network using a message entry device, such as a telephone, an alphanumeric entry messaging device or a computer terminal. The messages are typically interconnected from the message entry device through the public switched telephone network (PSTN) to a paging terminal. The paging terminal receives the messages and processes the message for transmission in a manner well known to one of ordinary skill in the art. Processing of the messages includes encoding the messages into one of a number of well known paging signaling protocols, such as the Post Office Communication Standard Advisory Group protocol (POCSAG), the Golay Sequential Code protocol (GSC), the FLEX signaling protocol or the ERMES signaling protocol, just to name a few. Once encoded, the wireless message is transmitted within the LAWN **112** to at least one wireless messaging unit **116**, such as to one or more pagers or data communication receivers.

encoding

The general operation of the WAWN **114** (Wide Area Wireless Network) is similar to the LAWN **112** network, except that the coverage area is larger than a single predetermined metropolitan area, and can include a plurality of local area wireless networks which have been interconnected to provide coverage to a number of separate metropolitan areas, or to provide regional, national or worldwide wireless messaging service.

As shown in FIG. 1, in the preferred embodiment of the present invention, the LAN **108** network and/or the WAN **110** network can be advantageously interconnected to the LAWN **112** network and/or the ~~WAWN **114** network~~ through the use of a wireless messaging server **104** (WMS), as will be described below. Messages, such as E-mail messages which are originated in the LAN **108** network and/or WAN **110** network are received by the wireless messaging server **104** which processes the E-mail messages received for delivery to a LAWN **112** network and/or a WAWN **114** network.

The interface between the wireless messaging server **104** and the wireless messaging network **106** employs one or more well known physical interconnection media such as serial direct- connect, serial via modem/PSTN, Ethernet™, token-ring, LocalTalk™, ARCnet as well as others. The protocol used for message initiation into the LAWN/WAWN is by way of example either TAP (Telocator Alphanumeric Paging), TFC/TAP (Telocator Format Conversion/Telocator Alphanumeric Paging), TNPP (Telocator Network Paging Protocol), TDP (Telocator Data Paging) or TIS (Telocator Inter-Switch) protocols.

FIG. 2 is an electrical block diagram of the wireless messaging server **104** in accordance with the preferred embodiment of the present invention. The wireless messaging server **104** includes a processor **200**, such as a personal computer or high performance computer workstation; a mass storage media **212**, such as a hard disk drive, a writable optical disk drive, a removable cartridge hard disk drive, or the like; a keyboard **208**, and a video display **210**, such as a CRT monitor or a dot matrix or other similar flat screen display. The mass storage media **212**, is coupled to the processor **200** through an I/O port **214** (input/output port) as is well known in the art. The keyboard **208** and the video display **210** are also coupled to the processor **200** through an I/O port **214** as is also well known in the art. The keyboard **208** is used to enter information into one or more databases which are described below, and which are required for operation of the wireless messaging server **104**. The keyboard **208** and video display **210** allow the operator of the wireless messaging server **104** to, among other things, monitor the

delivery of messages, and to recover message processing data such as is used for billing purposes or to monitor the wireless messaging server **104** usage. It will be appreciated that additional uses for the keyboard **208** and video display **210** can be provided as well, such as providing status messages to the message senders which are generated by the operator of the Wireless messaging server **104**.

As shown in FIG. 2, the processor **200** includes, by way of example, a CPU **202** (central processing unit) which controls the operation of the wireless messaging server **104**. Coupled to the CPU **202** is a read only memory (ROM) **218** which stores firmware controlling the basic operation of the processor **200**. Also coupled to the CPU **202** is a random access memory (RAM) **216** which is used to temporarily store E-mail messages as they are received, and further stores firmware utilized in the processing of the E-mail messages, as will be described in detail below. The random access memory **216** and read only memory **218** couple to the CPU **202** through an address/data/control bus **220** which provides access to the random access memory **216** and read only memory **218** in a manner well known to one of ordinary skill in the art. The CPU **202** also couples to an I/O port **214** which provides communication with the mass storage media **212**, the keyboard **208** and the video display **210**, as described above. The CPU **202** also couples to an E-mail input interface **204** which enables receiving E-mail messages generated within the wired messaging network **102**.

The CPU **202** also couples to an output interface **206** which enables delivering the wireless messages generated by the wireless messaging server **104** to the wireless messaging network **106** using any of a plurality of different network configurations and protocols, such as described in Table I that follows.

generate at server

Application	Protocol	Network
Page Submission (Alpha/Numeric)	TAP	Serial Connection
		Modem Dial-up Serial Connection
	TNPP	Serial Connection
		Modem Serial Connection
	TDP	Serial Connection
		Modem Dial-up Serial Connection
	TIS	TCP/IP - Ethernet
		TCP/IP - Token Ring
		TCP/IP - SLIP
		TCP/IP - PPP
Page Submission (Binary)	TFC/TAP	Serial Connection
		Modem Dial-up Serial Connection
	TNPP	Serial Connection
		Modem Serial Connection
	TDP	Serial Connection
		Modem Dial-up Serial Connection
	TIS	TCP/IP - Ethernet
		TCP/IP - Token Ring
		TCP/IP - SLIP
		TCP/IP - PPP

Table I

Returning to FIG. 2, as E-mail messages are received at the E-mail input interface **204** over one of the input network types identified in Table I, the E-mail messages are temporarily stored in the mass storage media **212** under the control of the central processing unit (CPU) **202**. The mass storage media **212** also stores one or more databases, to be described below, which are used by the CPU **202** to direct the delivery of the wireless message generated by the wireless messaging server **104** to the wireless messaging unit **116**. During E-mail message processing, the CPU **202** recovers the E-mail messages from the mass storage media **212**, and using routines active in a random access memory (RAM) **216**, processes the E-mail messages for delivery to the wireless messaging network **106** through the output interface **206** using one or more of the networks and protocols identified in Table II above.

As will be appreciated from the description provided above, the wireless messaging server **104**, in addition to processing E-mail messages generated in the wired messaging network **102** for delivery by the wireless messaging network **106**, is also capable of dynamically switching the E-mail input interface **204** between a number of networks and protocols, such as described in Table I, as well as switching the output

interface **206** between a number of networks and protocols, such as described in Table II.

By way of example, the processor **200** is a Sparc 5™ or Sparc 10™ workstation or the like which includes the keyboard **208** and video display **210**, and which is manufactured by Sun Microsystems of Sunneyvale, California. The processor **200** preferably includes at least 16M Bytes of random access memory, and can include up to 64M Bytes of random access memory, depending upon the E-mail message volume anticipated within the system. Likewise the mass storage device can be the internal hard disk drive supplied with the workstation, which is typically 500 M Byte, but can be smaller or larger depending on the system requirements, and can be externally located as well. The processor **200** preferably includes the use of a Unix™ multitasking operating system or the like having a SMTP E-mail support.

FIG. 3 is a block diagram showing memory partitioning within the wireless messaging server **104** in accordance with the preferred embodiment of the present invention. Memory partitioning occurs in both the mass storage media **212** and the random access memory **216** as shown by way of example in FIG. 3.

In the preferred embodiment of the present invention, the mass storage media **212** contains several files described below which are used in the processing of E-mail messages into wireless messages. The Operating System Software **315** is responsible for offering a preemptive-multitasking environment with E-mail, file input/output and networking services implemented preferably using a Unix™ based computer, such as described above. The Wireless Messaging Server Software **320** is the actual executable controlling program that is loaded into random access memory (RAM) **216**, and which controls processing of the E-mail messages into wireless messages.

The Target Database **325**, is shown by way of example in Table II below, and is responsible for providing target identifier look-up information. The target identifier look-up information includes such information as at least one predetermined wireless selective call user address corresponding with a wireless selective call user identifier and a wireless messaging unit address (WMU address), all of

Unit ID associated w/ e-mail account.

which serve to uniquely identify the wireless messaging unit **116** within a particular Wireless messaging network **106** to which an E-mail message is directed. The wireless messaging unit address is also often referred to as a pager cap code or a unit ID. The target identifier look-up information also includes a Wireless Messaging Unit Type (WMU TYPE) which designates the type of message information which can be received by the wireless messaging unit **116**. As shown in Table II, the WMU TYPE can be a numeric message (NUMERIC), an alphanumeric message (ALPHA) or an information service message (DATA). It will be appreciated that other wireless message types can be utilized as well. The target identifier look-up information also includes a Service Name identifying the service network name to which the E-mail message is directed for transmission. In the preferred embodiment of the present invention, the Target identifier takes the form of the wireless message recipient's First Name and Last Name, as shown, although it will be appreciated that other forms of Target identifier identification can be used as well. In addition, as will be described below, the need for the Target Database can be, in certain instances, obviated when there is enough information within the Target identifier provided within the E-mail message to enable the wireless messaging server **104** to derive the WMU address, WMU Type and Service Name, as will be described below.

device type
- type of msg receivable

TARGET DATABASE				
TARGET IDENTIFIER				
FIRST NAME	LAST NAME	WMU ADDRESS	WMU TYPE	SERVICE NAME
GERALD	TALTON	011325	NUMERIC	P-NET
GERALD	TALTON	011328	ALPHA	S-PAGE
RICHARD	GEIL	223425	ALPHA	DEFAULT
BOB	WIENER	123546	DATA	P-TEL

TABLE II.

The Service Name, shown in Table II, offers a cross reference (tag) into various databases to be described below that contain connection and protocol information necessary to communicate with a LAWN **112** network and/or a WAWN **114** network. The WMU address offers the actual address of the Wireless

messaging unit **116** within the previously specified LAWN **112** network and/or a WAWN **114** network. The WMU Type offers a certain level of validation and encoding insight for the wireless messaging unit **116**, such as whether the wireless messaging unit **116** is a ~~numeric pager;~~ an alphanumeric pager; or a data, or ~~information service, receiver~~.

Returning to FIG. 3, the Error Log **328** is used by the Send Message to Wireless Service process **420** described below to log any and all wireless message dispatch errors. These errors are read as Status Information from the Send Message to Wireless Service process **420**.

The Message Log Switch **330** is used to control whether or not message logging is enabled by the WMS (Wireless messaging server) System Administrator **402** described below, and is one of the WMS System Administrator **402** system configuration commands.

The Message Log **335** is a memory storage area used to log parsed message information such as the Target identifier, sender information including the E-mail address, and in certain instance the sender's full name, and other information, such as a time/date stamp, a Message Spool File reference number, an acknowledge flag and an evaluated success indication, as will be described below.

The Spool Directory **337** is a directory containing multiple Message Spool Files where the E-mail messages, shown for example as E-mail message 1 through E-mail message N in FIG. 3, are copied for later analysis as Status Information.

The Service Database **340** is responsible for storing service level parameters such as shown by way of example in Table III that follows.

Service Name	Service Password	Message Size Limit	Last Usage Date	Message Running Total	Service Constants Record	Connection Constants Record
default		240	2/16/95	13456	1	2
S-Page	hello	400	4/12/94	1201	2	1
M-Comm	xxxx	0	4/10/94	802	1	3

Table III

The Service Database **340** includes a Service Name and parameters such as service passwords, message size limitations, last usage date, message running total and references to records in a Service Constants Database **345**, such as shown in Table V that follows, and a Connection Constants Database **350**, such as shown in Table IV that follows. The Service Name identifies within the wireless messaging network **106**, the LAWN **112** network and/or WAWN **114** network to which the wireless message is sent, and unless otherwise specified, includes at least a default network identifier whose Service Name is "default" and which identifies a default local area or wide area wireless messaging network. Additional wireless messaging networks can also be listed and are identified by unique Service Names, such as shown. The Service Password allows the wireless messaging server **104** dispatch access to the wireless messaging network **106**, and more particularly to the LAWN **112** network and/or WAWN **114** network to which the wireless message is to be sent. The Message size limit indicates the maximum number of characters of the E-mail message which can be sent within the wireless message. Any additional number of characters within the E-mail message will be truncated by the wireless messaging server **104**. The Last Usage Date and Message Running Total are statistics maintained by the wireless messaging server **104** that offers service level utilization information. The Service Constants Record number and Connection Constants Record number reference records within the Service Constants Database and the Connection Constants Database.

Size limit

Record No.	Connection Type	Port	Phone Number	Network Address	Backup Connection
1	M	/dev/cua	9,4567890		
2	D	/dev/cub			1
3	M	/dev/cua	9,234565		
4	N			145.67.34.1	

Table IV

The Connection Constants Database **350** shown by way of example in Table IV, and is responsible for specifying the

method of connection to the named service, i.e. LAWN **112** network and/or WAWN **114** network. This Connection Type can vary over several types of records specifying network connection type, such as leased line or dial-up connections to the service, modem (M), direct (D) or Network (N) connections. The record can also offer up a backup reference to another network connection type in case the first network connection type is not capable of being connected to, such as shown in Table IV record 2, where when the regular connection is not made, the backup connection is referenced to as the alternate method of connection.

wired canada to wireless net.

The Service Constants Database **345** shown in Table V is responsible for offering up wireless message dispatch protocol soft-coded constants that include the protocol type, and string and timer values used in the protocol with the Wireless messaging network **106**.

Record #	Protocol Type	Init Delay	Init String	TNPP Address	TNPP Packet Size
1	TAP	2	ID=		
2	TNPP			3	<ESC>PG1

Table V

As shown in Table V above, there is a controlling filed of the Table that decides whether certain fields corresponding to columns in the Table contain information or not. In the example above, record 1 is a TAP protocol type, hence only TAP protocol type contains the fields "Init Delay" and "Init String". In the case of protocol 2, the protocol type is TNPP, hence only TNPP protocol parameters are specified, as shown.

Returning to FIG. 3, the random access memory **216** contains several process images used in the processing of E-mail messages into wireless messages. The Send Mail process **365**, shown for by way of example as Send Mail_1 through Send Mail_N, are temporarily allocated blocks of memory that contain the Send Mail process **365** which is invoked when a LAN **108** network or WAN **110** network connection is completed, and which is responsible for accepting a network submittal of an

E-mail message. The WMU message process **370**, shown as WMU message_1 through WMU message_N, are temporarily allocated blocks of memory associated with E-mail messages being processed into a wireless message or page. It will be appreciated that a single E-mail message can in fact be processed into a multiple number of wireless messages or pages as will be described below. The code section associated with the Send Mail process **365** is shared in the code image named Wireless Messaging Server Software **320**. This is the actual code that is executed with varied data to result in E-mail messages being converted to wireless messages (WMU messages) and being dispatched to the wireless messaging network **106**. The Operating System Software **315** image is responsible for offering task switching, file services and other basic operating system services.

The Send Mail process **365** is responsible for receiving the E-mail message on the wireless messaging server **104** and for activating the Wireless Messaging Server Software **320** by loading the software from the mass storage media **212** into random access memory **216** and executing the code. The Wireless messaging server Software **320** image processes the message in the random access memory space associated with the WMU message **370**, identified as WMU message_1 through WMU message_N. During message processing, the unprocessed E-mail message is copied to the Spool Directory **337**. The unprocessed E-mail message is used during processing of the Wireless Messaging Server Software **320**. During this processing, the Wireless Messaging Server Software **320** will log pertinent processing variables to the Message Log **335**, as described below, when the Message Log Switch **330** is active. The processing will also use the Target Database **325** and Target identifiers found in the E-mail message to resolve the message into a wireless messaging unit **116** address (not shown in FIG. 3) and LAWN **112** network or a **WAWN 114** network service name for each target identifier. After the resolution is complete, the Out Of Service Switch **355** is checked. When the Out Of Service Switch **355** is set, then the Out Of Service message **360** is sent back to the message originator in an E-mail message which includes the message originator's E-mail address, and processing is

stopped. Otherwise, the wireless message is dispatched to the wireless messaging network **106**. This is done by the software cross-referencing the LAWN **112** network or WAWN **114** network service name in the Service Database **340**. The Service Database **340** includes records of various LAWN **112** network and/or a WAWN **114** network services and statistical information and record references to the Service Constants Database **345** and the Connection Constants Database **350**. The Service Constants Database **345** details various protocol constants used in the protocol between the wireless messaging server **104** and the wireless messaging network **106**. The Connection Constants Database **350** details various protocol constants used in the protocol responsible for acquiring a connection to the Wireless messaging network **106**. When there are any difficulties in sending the message successfully to the wireless messaging network **106**, then the errors associated with the problem are logged to the Error Log **328** and an error report is sent back to the originator of the E-mail message.

FIG. 4 is a system software context diagram **400** for the wireless message delivery system **100** in accordance with the preferred embodiment of the present invention. FIG. 4 shows the overall software context in which the Wireless Messaging Server Software **320** operates. The Wireless messaging server Software **320** accepts an E-mail message, referred to in FIG. 4 as the "Message", from the Wired messaging network **102**. The Message may or may not result in the Wireless Messaging Server Software **320** generating a Wireless Message Submission, to be described below, to the wireless messaging network **106**. Upon generation of the Wireless Messaging Submission to the wireless messaging network **106**, the wireless messaging network **106** will reply with a Message Submission Status, to be described below, back to the Wireless Messaging Server Software **320**. When there are any problems incurred in sending the Message to the wireless messaging network **106**, then a Message Problem, to be described below, will be sent back to the Wired messaging network **102**. Optionally, a Message Verification, to be described below, would be sent back to the wired messaging network **102** when the Message is successfully sent to the wireless messaging network **106**. The WMS System

Administrator **402**, shown and described in FIG. 4, is a person responsible for inputting various System Configuration Commands, to be described below, to be used by the Wireless messaging server Software **320**. The System Configuration Commands may or may not result in the generation of System Configuration Status, to be described below, which is sent to the WMS System Administrator **402**. Also, in certain situations the Wireless Messaging Server Software **320** will supply the WMS System Administrator **402** with Status Information, to be described below, regarding the present state of the wireless messaging server **104**.

FIG. 5 is an overall software architecture diagram **500** for the wireless message delivery system **100** in accordance with the preferred embodiment of the present invention. FIG. 5 shows a decomposition of the Wireless Messaging Server Software **320** into its component parts, which in the preferred embodiment of the present invention is shown as the Process Message process **410**, the Send Message to Wireless Service process **420** and the Configure WMS System process **430**, in conjunction with the Target Database **325**, the Service Database **340**, the Service Constants Database **345** and the Connection Constants Database **350**. Upon activation of the Process Message process **410** by the receipt of an E-mail message, herein after referred to as "Message" in FIG. 5, from the wired messaging network **102**, the Process Message process **410** is responsible for resolving the Message into one or more Wireless Message Requests, as will be described below. During the Process Message process **410**, the Target Database **325** is referenced, as described in FIG. 3. When the Message can not be resolved into one or more Wireless Message Requests, or there are problems encountered by the Process Message process **410**, then a Message Problem will be sent back to the wired messaging network **102**. Again, optionally a Message Verification which is requested by the E-mail message originator can be sent back to the wired messaging network **102** upon a Message Success Indication being received by the Process Message process **410** from the Send Message to Wireless Service process **420**. The Process Message process **410** will

also send Status Information to the WMS System Administrator **402** in certain conditions, to be described below.

The Send Message to Wireless Service process **420** is responsible for connecting to, and sending, the Wireless Message Submission to the Wireless messaging network **106** upon receiving a Wireless Message Request. The Send Message to Wireless Service process **420** functions by first referencing the Service Database **340**, the Service Constants Database **345** and the Connection Constants Database **350**, as described in FIG. 3, to connect to, and to send, the Wireless Message Submission to the Wireless messaging network **106**. The Wireless Message Submission results in a Message Submission Status being generated by the wireless messaging network **106** that is interpreted by the Send Message to Wireless Service process **420**, and sent back to the Process Message process **410** as a Message Success Indication, to be defined below. Upon any successful Message Submission Status being returned from the wireless messaging network **106**. The last usage date will be updated to the present date, and the message running total will be incremented by the number of successful dispatches. This updated record is subsequently written back to the Service Database **340**.

The Configure WMS System process **430** is responsible for allowing the WMS System Administrator **402** to monitor information stored in the Target Database **325**, the Service Database **340**, the Service Constants Database **345** and the Connection Constants Database **350**, as will be described below. The Configure WMS System process **430** is responsible for allowing the WMS System Administrator **402** to configure the wireless message delivery system **100** by allowing the WMS System Administrator **402** to add, change, and delete information stored in the Target Database **325**, the Service Database **340**, the Service Constants Database **345** and the Connection Constants Database **350**, as will also be described below. Status information written into the Service Database **340** by the Send Message to Wireless Service process **420** is read from the Service Database **340** by the Configure WMS System process **430** and relayed to the WMS System Administrator **402**, as will be described further below.

FIG. 6 is a message processor software architecture diagram for the Process Message process **410** in accordance with the preferred embodiment of the present invention. The Process Message process **410** includes a Parse Message process **610**, a Log Message Processing process **650** and a Dispatch Wireless Message process **660**. The Parse Message process **610** is responsible for first copying the entire E-mail message, herein after referred to as the "Message" in FIG. 6, to the Spool Directory **337** and then to separating the various parts of the Message into various fields of information, including but not limited to: Sender information field including the E-mail address of the sender and optionally the Full Name of the sender, Recipient(s) field of the Message which may be zero or more, the actual wireless message to send and a Verify flag which is set by the E-mail message originator and that indicates whether a Message Verification should be sent to the E-mail message originator upon a Message Success Indication, to be described below.

The Log Message Processing process **650** is primarily an information switch. When the Logging Switch **630** has been set by a System Configuration Command as described above, then all information input will be passed on to the Message Parse Log **640**. The Message Parse Log **640** provides one of the pieces of Status Information to the WMS System Administrator **402**. The Log Message Processing process **650** also labels the various fields obtained from the Parse Message process **610**. The labeling allows easier inspection of the Message Parse Log **640**.

The Dispatch Wireless Message process **660** is responsible for resolving the various Recipient(s) into a wireless messaging service name and wireless messaging unit address. This is done by applying a set of rule that are described in detail with FIG. 17 below. Further examples of the input format are given in FIGs. 10 and 12 below. The Target Database **325** is optionally referenced for a matching Target Entry. Next a Wireless Message Request will be sent out for each successfully resolved Recipient. For each Wireless Message Request, a Message Success Indication, as described above, will be received back. Upon receiving a Message

Success Indication for every successfully resolved Recipient, an Evaluated Success Indication is formulated indicating three different levels of success: Successful, Partially Successful or Failure. When any of the Recipients can not be resolved, or the Evaluated Success Indication isn't Successful, then a Message Problem is sent back to the wired messaging network **102**. Also, when the Verify Flag is set, as described above, indicating that the message originator has requested an E-mail Message Verification, and the Evaluated Success Indication is Successful, as described above, then a Message Verification will be sent to the wired messaging network **102**.

FIG. 7 is a message parsing software architecture diagram describing the Parse Message process **610** for the wireless messaging server **104** in accordance with the preferred embodiment of the present invention. The Parse Message process **610** includes a Distribute Message process **710**, a Evaluate/Verify Flag process **750**, a Find Recipient(s) process **740**, an Extract Wireless Message process **730**, and a Find Sender process **720**. The Distribute Message process **710** acts as a Message distribution point for the E-mail message herein after referred to as the "Message" in FIG. 7, to the Message Spooler **620** and to the processes to be described below. The Evaluate/Verify Flag process **750** is responsible for extracting from the "Subject:" field of the Message, as described in FIG. 9 below, the case insensitive keyword "verify" which is entered by the message originator as a request for an E-mail message verification on a successful message dispatch from the Wireless messaging server **104** to the wireless messaging network **106**. When the keyword "verify" is found, then the Verify Flag is set, otherwise the Verify Flag is not set. The Find Recipient(s) process **740** is responsible for looking at the "To:" field of the Message in order to find the applicable recipient. The Extract Wireless Message process **730** is responsible for examining the format of the Message, as described below, and the Sender Information, and for generating the actual wireless message to be sent to the wireless messaging network **106**. The Find Sender process **720** is responsible for extracting Sender Information from the "From:" field of the Message.

FIG. 8 is a wireless message dispatch architecture diagram describing the Dispatch Wireless Message process **660** for the wireless messaging server **104** in accordance with the preferred embodiment of the present invention. The Dispatch Wireless Message process **660** includes a Send OOS Message process **810** (Out-of-Service message) , a Find WMU Address and Service process **820**, a Dispatch Wireless Message process **840**, and an Out of Service Flag **830**. The Out of Service Flag **830** acts as a simple switch. When the Out of Service Flag **830** is set, then the Send OOS Message process **810** is activated and sends a preset Message Problem indicating "Out Of Service" back to the wired messaging network **102** to the E-mail message originator. Otherwise when the Out of Service Flag **830** is not set, then the Dispatch Wireless Message process **840** is activated instead. The Dispatch Wireless Message process **840** accepts the Sender Information, the wireless message and the Verify Flag from the Parse Message process **610**, and waits for all of the Recipient/WMU Lookup pairs, to be described below. Upon receiving the Sender Information, the wireless message and the Verify Flag from the Parse Message process **610**, the Dispatch Wireless Message process **840** will then scrutinize the Recipient/WMU Lookup pairs. When any of the Recipient(s) do not have exactly one WMU Lookup then a Message Problem will be sent back to the wired messaging network **102**. Otherwise, when there is one WMU Lookup for any Recipient, then a Wireless Message Request will be sent for all of those Recipients identified by one Recipient/WMU Lookup pair, and the Message Success Indication received by the Dispatch Wireless Message process **840** for each Wireless Message Request. In the Recipient/WMU Lookup pair, the term Recipient refers to the target identifiers. The Dispatch Wireless Message process **840** generates an Evaluated Success Indication which takes on three values: Successful which occurs when all the Message Success Indications are true, Partial Success occurs when at least one Message Success Indication is true, and Failure occurs when no Message Success Indications are true. The Evaluated Success Indication generated summarizes whether all the Wireless Message Requests were successful or not as described above. Finally, when the Verify Flag input is set, and all of the

Message Success Indications are true, then a Message Verification will be sent back to the wired messaging network **102**.

FIG. 9 is a diagram of a typical E-mail message sent from the wired messaging network **102** in the prior art SMTP E-mail message submission protocol. It will be appreciated that other E-mail message submission protocols can also be sent from the wired messaging network **102**, such as, but not limited to: X.400 messages, MHS (Mail Handling System™ messages by Novell™, and Microsoft Mail™ messages just to name a few.

As shown in FIG. 9, an SMTP E-mail message is formatted such that the message includes an SMTP E-mail Header **910**, a first blank line **920** functioning as an SMTP Header/Body Separator and SMTP E-mail Body **930**. The SMTP E-mail Header **910** includes one or more lines representing different SMTP-standard mail fields such as a "Date:" field, a "From:" field, a "To:" field and optionally a "Subject" field, such as described in Internet RFC 822, "Standard for the Format of ARPA Internet Text Messages"; RFC 821, "Standard for Simple Mail Transfer Protocol"; and RFC 1123, "An extension to RFC 821 and RFC 822". Each SMTP-standard mail field, as described above, will generally have a structure of the field name followed by a colon, and then the data associated with the field. The SMTP Header/Body Separator is always the first blank line found when scanning the E-mail message from top to bottom. The SMTP E-mail Body **930** is shown as the section of the E-mail message that the message originator has input for sending the E-mail message to the message recipient. The SMTP E-mail Body **930** has no particular format, and can include by way of example as shown, a Salutation, a message and a Complementary Close.

In the context of the description provided above, and as shown in FIG. 9, the SMTP E-mail Header **910** includes a DATE field identifying the date of the E-mail message transmission, a FROM field indicating the name of the E-mail message originator, a TO field indicating the name of the E-mail recipient, and a SUBJECT field indicating the subject of the E-mail message. As described above, the SMTP E-mail Header **910** is separated from the SMTP E-mail Body **930** by a first

blank line **920** functioning as an SMTP Header/Body Separator. The SMTP E-mail Body **930** presents the actual E-mail message being sent, which by way of example includes the name of the message recipient, the message and the name of the message originator. It should be noted that there is no special significance give to the use of blank lines within the SMTP E-mail Body **930** when used in accordance with the prior art described above.

FIG. 10 is a diagram of one example of an E-mail Paging Addressing Scheme using an E-mail Alias for addressing a wireless messaging unit **116** in accordance with the preferred embodiment of the present invention. The E-mail Paging Addressing Scheme using an E-mail Alias utilizes the basic structure of an SMTP E-mail message, such as described above, and in addition includes a unique structure which provides activation of the wireless messaging server **104** through an E-mail alias pipe. The E-mail Body **930** then employs a unique structure including target identifiers and a wireless message.

The SMTP E-mail Header **910** has the same structure as the typical SMTP E-mail message shown in FIG. 9. However, unlike the SMTP E-mail message of FIG. 9, the "To:" field is not addressed directly to a message recipient residing in the wired messaging network **102**, but rather is advantageously addressed to a fixed E-mail address which is responsible for offering E-mail/paging services, i.e., the wireless messaging server **104** in accordance with the preferred embodiment of the present invention. As shown by way of example in FIG. 10, the fixed E-mail address which is shown as the contents of the "To" field is "pager@pts.mot.com", where the first SMTP address portion shown as "pager@" defines the alias for activation of the wireless messaging server **104** through the use of an alias pipe, to be described below, and the second address portion, shown as "pts.mot.com" directs the E-mail message to be delivered to the particular wireless messaging server **106** identified.

Following the first blank line **920** of the SMTP E-mail message is located the SMTP E-mail Body **930**. In this instance, the SMTP E-mail Body **930** includes three uniquely discernible parts: a Target identifier List **1010** comprising

one or more Target identifiers as described above, a delimiter **1020**, and the wireless message **1030** to be sent. The Target identifier List **1010** section is identified as the first sequence of non-blank lines in the SMTP E-mail Body **930**. The Target identifier List **1010** includes at least one wireless messaging unit address, as described above, and upon further inspection of the Target identifier List **1010** section of the SMTP E-mail Body **930** reveals, by way of example, several target identifier types can be simultaneously identified. The first Target identifier is listed by name in the format of "firstname_lastname", i.e. "richard_geil". This first Target identifier assumes that the wireless messaging server **104** can search the Target Database **325** to find a single corresponding WMU address and Wireless Messaging Service. The second Target identifier shown explicitly supplies a WMU address in the format of "address", i.e., "9834", but omits the Wireless Messaging Service Name. When a single address is encountered as shown, a "default" Service Name is assumed. The next two Target identifiers listed by name in the format of "address.servicename" explicitly specify a WMU address and Service Name, which by way of example is "345612.s-page" and "882363.m-comm" which direct the E-mail messages to the S-Page and M-comm Wireless Messaging Services. In the latter example of "address.servicename", no assumptions or lookups are required as to the service provider name.

The delimiter **1020** is defined as the first occurrence of one or more consecutive blank lines which follow the Target identifier list **1010**, and which separates the Target identifier list **1010** from the message, The delimiter **1020** is represented as a predetermined keystroke sequence which comprises by way of example in the preferred embodiment of the present invention, the occurrence of two or more carriage return/new line characters which are typically input with a "Return/Enter" key on a conventional keyboard. The actual wireless message is then located within the SMTP E-mail Body **930**, following the delimiter **1020**.

FIG. 11 is a context configuration diagram for addressing a wireless messaging unit **116** in accordance with the preferred embodiment of the present invention by using E-mail alias

addressing for addressing mail relay computers which are mail routing and relaying processors, the purpose of which is to accept E-mail from an SMTP Mail Super Domain, embodied as a mail relay computer and associated Local Mail Domains and Sub-Domains, also embodied as a mail relay computers which route the E-mail messages appropriately. FIG. 11 shows that an SMTP Mail Super Domain **1110**, shown for example as "mot.com", then connects to a modified Local Mail-Domain **1120**, shown for example as "pts.mot.com". The modification to the conventional SMTP E-mail Local Mail Domain **1120** is advantageously a unique addition to the aliases file, which is shown for example as "/etc/aliases" file, and which is achieved by adding the term "pager", which is defined as by way of example "pager@wms". Under the Local Mail-Domain **1120** there are also shown other Local Mail Sub-Domains **1130**, and the wireless messaging server **104** in accordance with the preferred embodiment of the present invention, which is also shown under the Local Mail-Domain **1120**. The host name assigned to the Wireless messaging server **104** is for example "wms" as listed in the host table which resides in the Local Mail-Domain **1120**. The Wireless messaging server **104** also advantageously has an addition to the alias file, where "pager" is defined as a Send Mail program pipe to the Wireless Messaging Server Software **320**.

FIG. 12 is a diagram of an E-mail paging addressing scheme using the E-mail sub-domain method for addressing a wireless messaging unit **116** in accordance with the preferred embodiment of the present invention. As shown in FIG. 12, an SMTP E-mail message using E-mail sub-domain addressing is formatted such that the message includes an SMTP E-mail Header **1210**, a first blank line **1220** representing an SMTP Header/Body Separator and the SMTP E-mail Body **1230**. The SMTP E-mail Header **1210** is of the same general structure as that of the SMTP E-mail Header **910** shown in FIG. 10, however, a critical difference is present in the SMTP E-mail Header **1210** as compared to the SMTP E-mail Header **910**. The information that was previously contained in the Target identifier List **1010** of the SMTP E-mail Header **910**, shown in FIG. 10, has been relocated and reformatted into a legitimate SMTP E-mail

address with the SMTP sub-domain, shown for example as "@pager.pts.mot.com". As in the SMTP E-mail Header **910** shown in FIG. 9, the SMTP E-mail Header **1210** includes one or more lines representing different SMTP-standard mail fields such as a "Date:" field, a "From:" field, a "To:" field and optionally a "Subject" field. Unlike that shown in FIG. 9, the Target identifiers are positioned in the "To:" field of the SMTP E-mail Header **1210**. Each of the Target identifiers is resolved as described above in FIG 10, however, the Target identifiers now represent actual E-mail addresses. The concept of E-mail/paging is, as a consequence, integrated with E-mail more seamlessly, and hence is easier for an E-mail message originator to learn to use. The SMTP Header/Body Separator **1220** is the same as the SMTP Header/Body Separator **920** in a standard SMTP E-mail message. The SMTP E-mail Body **1230** is used as the message to send to the Wireless messaging unit **116** identified by the Target identifiers as described above.

FIG. 13 is a context configuration diagram for addressing a wireless messaging unit **116** using sub-domain paging in accordance with an alternate embodiment of the present invention. FIG. 13 shows essentially the same configuration of Mail-Domains as shown in Figure 11. However, unlike that of FIG. 11, the configuration of the linkage between the Local Mail-Domain **1110** and the wireless messaging server **104** is advantageously different as will be described below. In the alternate embodiment of the present invention shown in FIG. 13, the host file, shown with a filename "/etc/hosts" in the Local Mail Domain **1120**, utilizes an alias for the host name, "wms" which is set to "pager" in this example. The addition of the alias effectively creates a new Sub-domain called, by way of example, "pager.pts.mot.com" which for the Local Mail Domain **1120**, is shown by way of example as "pts.mot.com". Also, the host name of the Wireless messaging server **104** is also set to reflect the host alias. Finally, a custom sendmail configuration file, shown by way of example as "/etc/sendmail.cf" is installed on the local wireless messaging server **104** such that any E-mail directed to an SMTP sub domain "@pager" is directed to the Wireless Messaging Server Software **320**.

FIGS. 14 through 20 are flow charts illustrating the operation of the wireless messaging server **104** in accordance with the preferred and alternate embodiments of the present invention.

Referring to FIG. 14, the Wireless Messaging Server Software **320** is invoked in response to the E-mail message being directed to the wireless messaging server **104**. Upon execution of the Wireless Messaging Server Software **320**, the E-mail message is delivered via a file handle into the executable. The Wireless Messaging Server Software **320** initiates the parsing of the E-mail message which was delivered. The first step in the parsing process is the extraction of the Recipient(s) and the wireless message to be sent from the E-mail message. The Recipient(s) are first extracted, at step **1404**, from the "To:" field of the SMTP E-mail Header **910**, **1210**. This is accomplished by first selecting the contents of the "To" field, and when the "To" field does not exist, at step **1406**, the contents of the "Apparently-To:" field is selected as the contents of the "To" field in a manner well known by one of ordinary skill in the art, at step **1408**. Otherwise when the "To" field is present in the SMTP E-mail Header **910**, **1210**, the "To" field contents is selected, at step **1406**.

The SMTP E-mail Body **930** of the E-mail message is then extracted at step **1410** by searching the E-mail message from the beginning of the message for the occurrence of a first blank line **920** denoted by a sequence of two end of line characters, as described above. Next, the E-mail address contained within the "To:" or "Apparently-To:" field is identified at step **1412**. When the E-mail address is identified as "pager@", at step **1412**, then the E-mail-alias form of E-mail paging is selected. In this instance, the Body of the E-mail message is scanned forward to the first occurrence of one or more blank lines **1020**, after which the wireless message **1030** is extracted, at step **1414**, from between the blank line **1020** and the end of the E-mail Body **930**. The Target identifiers **1010** for the wireless message are next extracted, at step **1416**, by scanning from the top of the E-mail Body **930** to the first occurrence of the one or more

blank lines **1020**. The Target identifiers, are then set to the Target identifier sequence **1010** as described above.

When the E-mail address of the "To:" or "Apparently-To:" field does not specify the Recipient(s) as "pager@", then the SMTP Sub-domain format for E-mail/paging is selected, at step **1412**. In this instance the wireless message is set to the SMTP E-mail Body **930**, at step **1418**, as extracted as previously described above. Next, each E-mail address in the "To:", "CC:" and "BCC:" fields are then searched for the "@pager" sub domain identifier. The E-mail addresses found will then be extracted and stripped of the "@pager" E-mail domains, and set to be equal to the Target identifiers, at step **1420**.

The wireless message processing continues with FIG. 15 which illustrates a flow chart which concentrates on the extraction of message originator information, and optionally the full name of the message originator for identification purposes to the wireless messaging unit **116**. First, the E-mail address of the message originator is extracted from the SMTP Header "From:" field, at step **1424**. Next, the SMTP Header "Subject:" field is scanned, at step **1426**, for the case insensitive keyword "from", and when found, the format of the SMTP Header "From:" field is examined to locate the full name of the sender which identifies the request from the message originator to have sender identification appended to the E-mail message. When the format of the E-mail address is one with text containing sections of text contained within parenthesis, at step **1428**, as for example "E-mail address (full name)", then the full name of the message originator is extracted from within the parenthesis, at step **1430**, and stored in the username variable. When the format of the E-mail address is one with text containing text enclosed within greater-than and less-than signs, at step **1432**, as for example "full name <E-mail address>", then the full name is extracted from the text outside of these signs, and stored in the username variable. Otherwise, when neither format of the "From:" field applies, then the actual raw contents of the "From:" field is extracted as the full name of the message originator, at step **1434**, and stored in the username variable. When the SMTP Header does not include the case insensitive

keyword "from", at step **1426**, no information is stored in the username variable. The final wireless message is then created, at step **1436**, by appending the username variable to the wireless message.

The wireless message processing continues with FIG. 16 which illustrates a flow chart which describes house keeping features, such as message parse logging, at step **1438**. The Wireless messaging server **104** checks to see if message parse logging is turned on, at step **1440**, as indicated by the Message Log Switch **330** being set. When the Message Log Switch **330** is set, then the wireless message and presently processed information associated with the wireless message is logged to the message parse log, at step **1442**. The information that is logged in the preferred embodiment of the present invention includes the message originator information in the form of an E-mail address and optionally a fullname, the Target identifiers, the wireless message, an indication of the verify flag being set, a time/date stamp for the entry, and a message Spooler message file name. It will be appreciated that more or less information can be logged depending upon the needs of the Wireless Messaging Server System Administrator **402**.

The wireless messaging server **104** then checks whether the "Out of Service" flag is set, at step **1444**. When the "Out of Service" flag is set, then an Out Of Service message **360** is sent back to the message originator as an E-mail message explaining that the Wireless messaging server **104** is not in service, at step **1446** and execution is stopped at step **1448**. The Out Of Service message **360** can also include an indication of why the Wireless messaging server **104** is out of service. When the "Out of Service" flag is not set, at step **1444**, then the wireless messaging server **104** continues processing at step **1612** shown in FIG. 17.

The wireless message processing continues with FIG. 17 which illustrates Target identifier resolution to wireless messaging unit **116** addresses and Service Names. As shown in FIG. 17, Target identifier resolution begins by locating a first Target identifier, at step **1450**, which may be one of a list of Target identifiers. When a number is explicitly given as the first character of the Target identifier, at step **1452**,

such as when the first and last names are omitted, then the number is assumed to be an explicit wireless messaging unit address as shown in Table II above. When only the number is specified, the "default" Service Name is also assumed, however, a Service Name can be explicitly specified by following the Wireless messaging unit **116** address by a period character and then Service Name, i.e., as for example "14576.s-page", such as shown in FIGs. 10 and 12. The target identifier will be further searched for the period character. When a period character is found, then the rest of the target identifier is assumed to be a Service Name for the wireless messaging unit **116** address. When the period character is not found, then the "default" Service Name is assumed. In either case, the Target Identifier resolution will result in a single (One) Wireless messaging unit **116** code and corresponding Service Name being found for this type of Target identifier. In another case, where the first character of the Target identifier is not a number, then the Target Database **325** is searched for a matching Target identifier. When no matching target name (None) is found, then an E-mail response is created/appended indicating a "Target identifier not found" error to the message originator, at step **1454**. When a single wireless messaging unit and Service Name is found for the Target identifier, then the wireless messaging unit address and Service Name are added to the list of wireless messaging unit **116** addresses, at step **1456**. When more than one wireless messaging unit **116** address and Service Name is found (>One) then a "Multiple Wireless messaging unit found for <Target identifier>" message response will be created/appended, at step **1460**, where <Target identifier> is the actual Target identifier searched for. When processing of the list of Target identifiers is not completed, at step **1460**, then the next Target identifier is located at step **1462**, and step **1452** through step **1454**, **1456** and **1458** are repeated. When processing of the list of Target identifiers is completed, at step **1460**, program flow continues to step **1464**, shown in FIG. 18.

FIG. 18 is a flow chart which illustrates the decision making process to determine what type of E-mail message to

send back or prepare for sending back to the message originator when there are problems resolving a Target identifier into a wireless messaging unit **116** address and Service Name. As will be described below, the E-mail message sent back to the message originator is also sent to the WMS System Administrator **402**. FIG. 18 also illustrates deciding whether or not to actually send a wireless message or stop execution based on the fact that there were no resolved Target identifiers and Service Names found. The first action that is taken is one of checking to see when in the previous address resolution step an E-mail response message was created, at step **1464**. When an E-mail response message doesn't exist, at step **1464**, then the wireless messaging server **104** will send the wireless message out, at step **1474**. When a wireless message has been created, at step **1464**, then there is at least one resolution problem reported in the message. The next question in this case is whether any resolutions were successful in generating a Target identifier or Service Name, at step **1466**. When no resolutions were successful, at step **1466**, and there is no Target identifier or Service Name to send a wireless message, then a "Page Failure" E-mail response message is sent to the message originator indicating possible resolutions, at step **1470** and the execution stopped, at step **1472**. When one or more resolutions were successful then a "Wireless Message Resolution Failure" E-mail response message is prepared, at step **1468**, and the wireless messaging server **104** will send the wireless message, at step **1474**. In the process of sending the wireless message, all events during the process will be logged to a log file, at step **1476**. This log file is used to decide whether or not all the wireless messages were successfully sent.

FIG. 19 is a flow chart describing the evaluation of the results of transmitting the wireless messages described in FIG. 18, and of sending a response back to the message originator in an E-mail message which includes the message originator E-mail address. When all the wireless message submissions were successful, at step **1478**, then a check is made as to whether or not the Acknowledgment E-mail feature is enabled, at step **1480**, and when not enabled, execution stops,

at step **1502**. When the Acknowledgment E-mail feature is enabled, at step **1480**, then an Acknowledgment response message is generated, and the successfully delivered wireless message and Target identifiers activated are listed in the response message, at step **1482**, and sent to the message originator in an E-mail message which includes the message originator E-mail address. Debug logging is next checked, and when debug logging is enabled, at step **1486**, than a success indication is logged to the log file, at step **1486**, and then execution stops at step **1502**. When debug logging is not enabled, at step **1484**, then execution stops at step **1502**.

When an indication is received that the wireless message submission was not successful, at step **1478**, then the wireless messaging server **104** checks whether any of the wireless message submissions were successful, at step **1488**, and classifies the message submission as Partially Successful. When any of the wireless message submissions were successful, then the wireless messaging server **104** will send a Partial Message Failure message indicating which wireless messaging units **116** were and were not activated, and the wireless messaging server **104** also appends system usage instructions to the Partial Message Failure message and send the Partial Message Failure message back to the message originator in an E-mail message which includes the message originator E-mail address, and also sends the E-mail message to the System Administrator **402**, at step **1490**. Whenever an E-mail message is sent to the message originator and the Wireless Message System Administrator **402**, system usage instructions are appended to the message. Debug logging is next checked, and when debug logging is enabled, at step **1492**, than a partial failure indication is logged to the log file, at step **1494**, and then execution stops at step **1502**. When debug logging is not enabled, at step **1492**, then execution stops at step **1502**.

When none of the wireless message submissions were successful, at step **1488**, then the wireless messaging server **104** sends a Message Failure message indicating all wireless messaging units which were not activated, and the Wireless messaging server **104** also appends system usage instructions to the message Failure message and sends the Message Failure

message back to the message originator in an E-mail message which includes the message originator E-mail address, and also sends the E-mail message to the system administrator, at step **1496**. Debug logging is next checked, and when debug logging is enabled, at step **1498**, than a failure indication is logged to the log file, at step **1500**, and then execution stops at step **1502**. When debug logging is not enabled, at step **1498**, then execution stops at step **1502**.

The interpretation of a Success indication is one where all Target identifiers were fully resolved and all wireless messages successfully submitted, which is why there is a Target identifier resolution failure check. The interpretation of a Failure is that absolutely no wireless messages were successfully generated. This leaves the classification of Partially Successful with all other cases. This classification will be logged to the log file when the debug logging feature is enabled.

FIG. 20 is a E-mail (SENDMAIL) Parsing Rule Structure diagram showing the various major rules sets used in the parsing of E-mail using the UNIX email relay and routing program SENDMAIL. The SENDMAIL program uses rules that are stored in the configuration file "/etc/sendmail.cf" to make decisions of how mail will be routed and reformatted. The configuration file "/etc/sendmail.cf" is contains sets of rules that are used to match the format of the email address in the To: field of the email. When a rule is found to match the present format of the email address a corresponding action is taken for that matching condition. The rules are arranged in sets that are numbered. The processing of the SENDMAIL program first starts with the evaluation of what mailer program will be used to route the mail. This is done by first applying the email address parsing rule set 3 **2001**. The rule set 3 **2001** is used universally to clean the email address and put it in a standard format. Next the rule set 0 **2002** is used to find resolve what mailer program will be used to route the email message. This is where the WMS system modifies the email system to capture all email addressed to the arbitrary SMTP E-mail sub-domain "@pager". An additional rule is added to the top of rule set 0 **2002** that looks for a matching email

address with an "@pager" in the address. All email of this type will be routed to a newly defined mailer program. The mailer program is defined using standard mailer definition rule and will activate the WMS Software. Therefore, there are fundamentally two changes that must be made to a configuration file "/etc/sendmail.cf" to support sub-domain paging: 1) add a rule to the top of rule set 0 **2002** as described above, and 2) add the definition of a new mailer program that activates the WMS software. The other purpose of the SENDMAIL program is to rewrite email addresses as appropriate. This is done first for the sender by applying rule set 3 **2001**, then 1 **2004**, then the rule set associated with the resolved mailer **2005**, then the cleanup rule set 4 **2007** to the contents of the From: field. Next, the rewriting is done for each of the recipients by applying rule set 3 **2001**, then 2 **2003**, then the rule set associated with the resolved mailer **2006**, then the cleanup rule set 4 **2007** to the contents of the From: field.

In summary, a wireless messaging system is presented comprising a wired messaging network for delivering E-mail messages between wired network nodes, and further for inputting E-mail messages for delivery to at least one wireless messaging unit. The wireless messaging system communicates with a wireless messaging server that receives and processes the E-mail messages inputted from the wired messaging network for delivery to the at least one wireless messaging unit. The E-mail messages comprise a simple mail transfer protocol (SMTP) address, a portion of which represents a wireless selective call user identifier. Further, a wireless messaging network is coupled to the wireless messaging server for delivering at least one wireless selective call message to the wireless messaging unit in response to correlating the wireless selective call user identifier with at least one predetermined wireless selective call user address.

The wireless messaging system communicates using at least one of a wired messaging network such as a local area (LAN) messaging network, a wide area (WAN) messaging network, a local area wireless (LAWN) messaging network, a wide area wireless (WAWN) messaging network. Moreover, in the preferred

embodiment, the wired messaging network delivers the E-mail messages to the wireless messaging server using an E-mail system compliant with RFC-822 SMTP E-mail. Preferably, the wireless messaging system utilizes TCP/IP protocol to transport the E-mail messages within the wired messaging network. Alternatively, message communication may be effected using protocols such as X.400 or the like, with minor modifications such as taught in the instant disclosure.

TCP/IP

Referring to the wireless messaging server, it includes an E-mail input interface coupled to the wired messaging network for receiving the E-mail messages inputted from the wired messaging network for delivery to the wireless messaging unit. A processor is coupled to the E-mail input interface for processing the E-mail messages inputted from the wired messaging network to determine (1) the wireless selective call user identifier including a wireless messaging unit address designating the wireless messaging unit, (2) a network identifier identifying a wireless messaging network from at least a portion of the SMTP address, and (3) add at least a portion of an information content of the E-mail messages associated with the SMTP address to the at least one wireless selective call message targeted for delivery to at least one wireless selective call messaging unit. After these step are performed, an output interface couples the at least one wireless selective call message to the wireless messaging network identified by the network identifier for delivering the E-mail messages to the wireless messaging unit designated by the wireless messaging unit address.

Lastly, the wireless messaging server includes a memory for storing a plurality of wireless selective call user identifiers and associated wireless messaging unit addresses and wireless network identifiers.

The E-mail messages, including the wireless messaging unit address, may be processed using a default network identifier stored in the memory. This is possible since a default wireless messaging network associated with the wireless messaging unit address stored in the memory is associated with the received E-mail messages by the processor. The processor determines the wireless messaging unit address,

and in response thereto, recovers from the memory the default network identifier identifying the wireless messaging network. Subsequently, the output interface delivers coupled to the processor delivers the at least one wireless selective call message to the wireless messaging unit designated by the associated wireless messaging unit address within the wireless messaging network identified by the network identifier. Note that the at least one wireless selective call user identifier identifies an intended recipient of the at least one wireless selective call message.

Additionally, the memory further stores a wireless messaging unit type associated with each of the plurality of wireless selective call user identifiers. This parameter may be used to identify any unique characteristics of the target unit, e.g., display capability, presentation means (audio, video, hardcopy).

In the preferred embodiment, the processor determines the at least one wireless selective call user identifier from the E-mail messages, and in response thereto, recovers from the memory, an associated wireless messaging unit address and network identifier identifying a wireless messaging network. As above, the output interface delivers the at least one wireless selective call message to the wireless messaging unit designated by the associated wireless messaging unit address within the wireless messaging network identified by the network identifier.

An additional feature allows the wireless messaging unit further to accept a request to have originator identification automatically appended to the at least one wireless selective call message. This allows the recipient of a wireless message to identify the sender or source of the message.

Another feature of the wireless messaging system is message receipt, delivery, and transmission verification. In this case, the E-mail messages comprise a message originator E-mail address that is used by the wireless messaging server to generate a reply status message to an originator of the E-mail messages. This reply status message indicates a success or failure in delivering the at least one wireless selective call message to the wireless messaging unit. Additionally,

the reply status message may further indicate a success or failure transmitting the at least one wireless selective call message to the wireless messaging network. These features allow positive verification of message delivery.

In the preferred embodiment of the present invention, the E-mail messages comprise an E-mail address of a form user@pager.entity.ext, with parameters user, pager, and entity.ext. Examples of this addressing and message delivery method were earlier discussed with reference to FIGs. 9-20. More particularly, the E-mail messages may include information content comprising at least one of a text message, an audio message, and a video message.

When using the user@pager.entity.ext form of addressing, the entity.ext parameter represents a destination node in the wireless messaging network to which the at least one wireless selective call message is directed. Similarly, the pager parameter represents a wireless messaging domain of a SMTP E-mail address.

Upon detection of the pager parameter in the user@pager.entity.ext format, the processor processes the SMTP E-mail address to determine the wireless messaging unit address associated with the user parameter and network identifier associated with the entity.ext parameter. Further, the processor extracts, in response to detecting the pager parameter, an information content of the E-mail messages associated with the SMTP address, to generate an information portion of the at least one wireless selective call message.

Following identification and extraction, the processor assembles, for either immediate local transmission of deferred remote transmission, the at least one wireless selective call message comprising the wireless messaging unit address and at least a portion of the information content of the E-mail messages. In the first case, the at least one wireless selective call message may be transmitted by a local wireless messaging system in real time. In the second case, the at least one wireless selective call message is preferably transferred (sent) to a remote paging system for either immediate or deferred transmission.

Regarding the user parameter, it represents a unique user and is selected from one of a full user name, a user name alias, the wireless messaging unit address, and the wireless selective call messaging unit identifier. Additionally, the unique user may comprise a predetermined list of wireless messaging users comprising a user group.

Referring to the alternate addressing form, the E-mail messages comprise an E-mail address of a form paging-identifier@entity.ext, with parameters paging-identifier and entity.ext. As with the preferred embodiment, the E-mail messages may include information content comprising a text message, an audio message; and a video message.

As before, the entity.ext parameter represents a destination node in the wireless messaging network to which the at least one wireless selective call message is directed. However, in the alternate addressing form, the paging-identifier parameter represents a wireless selective call messaging unit identifier compatible with an RFC-822 compliant SMTP E-mail system and recognizable by the wireless messaging server. Once the wireless messaging server recognizes the paging-identifier parameter as having a corresponding wireless selective call messaging unit identifier, the processor processes an SMTP E-mail address to determine the wireless messaging unit address associated with the paging-identifier parameter and network identifier associated with the entity.ext parameter. Additionally, the processor extracts an information content of the E-mail messages associated with the SMTP address to generate an information portion of the at least one wireless selective call message. Local and remote transmission or delivery are accomplished in the same manner regardless of the addressing form used.

Similarly, as with the user parameter in the preferred embodiment, the paging-identifier represents a unique user and is selected from one of a full user name, a user name alias, the wireless messaging unit address, and the wireless selective call messaging unit identifier. Additionally, the unique user may comprise a predetermined list of wireless messaging users comprising a user group.

We claim:

CLAIMS

1. A wireless messaging system, comprising:

a wired messaging network for delivering E-mail messages between wired network nodes, and further for inputting E-mail messages for delivery to at least one wireless messaging unit;

a wireless messaging server, coupled to the wired messaging network, for receiving and processing the E-mail messages inputted from the wired messaging network for delivery to the at least one wireless messaging unit, the E-mail messages comprising a simple mail transfer protocol (SMTP) address, a portion of which represents a wireless selective call user identifier; and

a wireless messaging network, coupled to the wireless messaging server for delivering at least one wireless selective call message to the wireless messaging unit in response to correlating the wireless selective call user identifier with at least one predetermined wireless selective call user address.

2. The wireless messaging system according to claim 1, wherein the wired messaging network is a local area (LAN) messaging network.

3. The wireless messaging system according to claim 1, wherein the wired messaging network is a wide area (WAN) messaging network.

4. The wireless messaging system according to claim 1, wherein the wireless messaging network is a local area wireless (LAWN) messaging network.

5. The wireless messaging system according to claim 1, wherein the wireless messaging network is a wide area wireless (WAWN) messaging network.

6. The wireless messaging system of claim 1 wherein the wired messaging network delivers the E-mail messages to the wireless messaging server using an E-mail system compliant with RFC-822 SMTP E-mail.

7. The wireless messaging system of claim 6, wherein the E-mail system utilizes TCP/IP to transport the E-mail messages within the wired messaging network.

8. The wireless messaging system of claim 1, wherein the wireless messaging server comprises:

an E-mail input interface, coupled to the wired messaging network for receiving the E-mail messages inputted from the wired messaging network for delivery to the wireless messaging unit;

a processor, coupled to the E-mail input interface, for processing the E-mail messages inputted from the wired messaging network to determine the wireless selective call user identifier including a wireless messaging unit address designating the wireless messaging unit and a network identifier identifying a wireless messaging network from at least a portion of the SMTP address, and add at least a portion of an information content of the E-mail messages associated with the SMTP address to the at least one wireless selective call message targeted for delivery to at least one wireless selective call messaging unit; and

an output interface, for coupling the at least one wireless selective call message to the wireless messaging network identified by the network identifier for delivering the E-mail messages to the wireless messaging unit designated by the wireless messaging unit address.

9. The wireless messaging system of claim 8, wherein the E-mail messages further include at least one wireless selective call user identifier, and wherein the wireless messaging server further comprises:

a memory for storing a plurality of wireless selective call user identifiers and associated wireless messaging unit addresses and wireless network identifiers.

10. The wireless messaging system of claim 9, wherein:

the E-mail messages include the wireless messaging unit address;

the memory stores a default network identifier identifying a default wireless messaging network associated with the wireless messaging unit address;

the processor processes received E-mail messages to determine the wireless messaging unit address, and in response thereto, recovering from the memory the default network identifier identifying the wireless messaging network; and

the output interface delivers the at least one wireless selective call message to the wireless messaging unit designated by the associated wireless messaging unit address within the wireless messaging network identified by the network identifier.

11. The wireless messaging system of claim 9 wherein the at least one wireless selective call user identifier identifies an intended recipient of the at least one wireless selective call message.

12. The wireless messaging system of claim 9 wherein the memory further stores a wireless messaging unit type associated with each of the plurality of wireless selective call user identifiers.

13. The wireless messaging system of claim 9, wherein the processor is further coupled to the memory , for processing received E-mail messages to determine the at least one wireless selective call user identifier, and in response thereto, recovering from the memory an associated wireless messaging unit address and the network identifier identifying a wireless messaging network; and

the output interface delivers the at least one wireless selective call message to the wireless messaging unit designated by the associated wireless messaging unit address within the wireless messaging network identified by the network identifier.

14. The wireless messaging system of claim 9, wherein the wireless messaging unit further comprises means for accepting a request to have originator identification automatically appended to the at least one wireless selective call message.

15. The wireless messaging system of claim 9, wherein the E-mail messages comprise a message originator E-mail address used by the wireless messaging server to generate a reply status message to an originator of the E-mail messages indicating a success or failure in delivering the at least one wireless selective call message to the wireless messaging unit.

16. The wireless messaging system of claim 15, wherein the reply status message may further comprise an indication of success or failure transmitting the at least one wireless selective call message to the wireless messaging network.

17. The wireless messaging system of claim 8, wherein the E-mail messages comprise:

an E-mail address of a form user@pager.entity.ext, with parameters user, pager, and entity.ext.

18. The wireless messaging system of claim 17, wherein the E-mail messages further comprise:

the information content comprising at least one of;

a text message;

an audio message; and

a video message.

19. The wireless messaging system of claim 17, wherein the entity.ext parameter represents a destination node in the wireless messaging network to which the at least one wireless selective call message is directed.

20. The wireless messaging system of claim 17, wherein the pager parameter represents a wireless messaging domain of a SMTP E-mail address.

21. The wireless messaging system of claim 20, wherein the processor processes the SMTP E-mail address in response to detecting the pager parameter, to determine the wireless messaging unit address associated with the user parameter and network identifier associated with the entity.ext parameter.

22. The wireless messaging system of claim 20, wherein the processor extracts, in response to detecting the pager parameter, an information content of the E-mail messages associated with the SMTP address to generate an information portion of the at least one wireless selective call message.

23. The wireless messaging system of claim 20, wherein the processor assembles, for immediate transmission by the wireless messaging server, the at least one wireless selective call message comprising the wireless messaging unit address and at least a portion of the information content of the E-mail messages.

24. The wireless messaging system of claim 20, wherein the processor assembles, for transmission by a remote wireless messaging server, the at least one wireless selective call message comprising the wireless messaging unit address, the network identifier, and at least a portion of the information content of the E-mail messages.

25. The wireless messaging system of claim 17, wherein the user parameter represents a unique user and is selected from one of:

a full user name;
a user name alias;
the wireless messaging unit address; and
the wireless selective call messaging unit identifier.

26. The wireless messaging system of claim 25, wherein the unique user comprises a predetermined list of wireless messaging users comprising a user group.

27. The wireless messaging system of claim 8, wherein the E-mail messages comprise:

an E-mail address of a form paging-identifier@entity.ext, with parameters paging-identifier and entity.ext.

28. The wireless messaging system of claim 27, wherein the E-mail messages further comprise:

the information content comprising at least one of;
a text message;
an audio message; and
a video message.

29. The wireless messaging system of claim 27, wherein the entity.ext parameter represents a destination node in the wireless messaging network to which the at least one wireless selective call message is directed.

30. The wireless messaging system of claim 27, wherein the paging-identifier parameter represents a wireless selective call messaging unit identifier compatible with an RFC-822 compliant SMTP E-mail system and recognizable by the wireless messaging server.

31. The wireless messaging system of claim 30, wherein the processor processes an SMTP E-mail address in response to detecting the wireless selective call messaging unit identifier, to determine the wireless messaging unit address associated with the paging-identifier parameter and network identifier associated with the entity.ext parameter.

32. The wireless messaging system of claim 30, wherein the processor extracts, in response to detecting the paging-identifier parameter, an information content of the E-mail messages associated with the SMTP address to generate an information portion of the at least one wireless selective call message.

33. The wireless messaging system of claim 30, wherein the processor assembles, for immediate transmission by the wireless messaging server, the at least one wireless selective call message comprising the wireless messaging unit address and at least a portion of the information content of the E-mail messages.

34. The wireless messaging system of claim 30, wherein the processor assembles, for transmission by a remote wireless messaging server, the at least one wireless selective call message comprising the wireless messaging unit address, the network identifier, and at least a portion of the information content of the E-mail messages.

35. The wireless messaging system of claim 27, wherein the paging-identifier represents a unique user and is selected from one of:

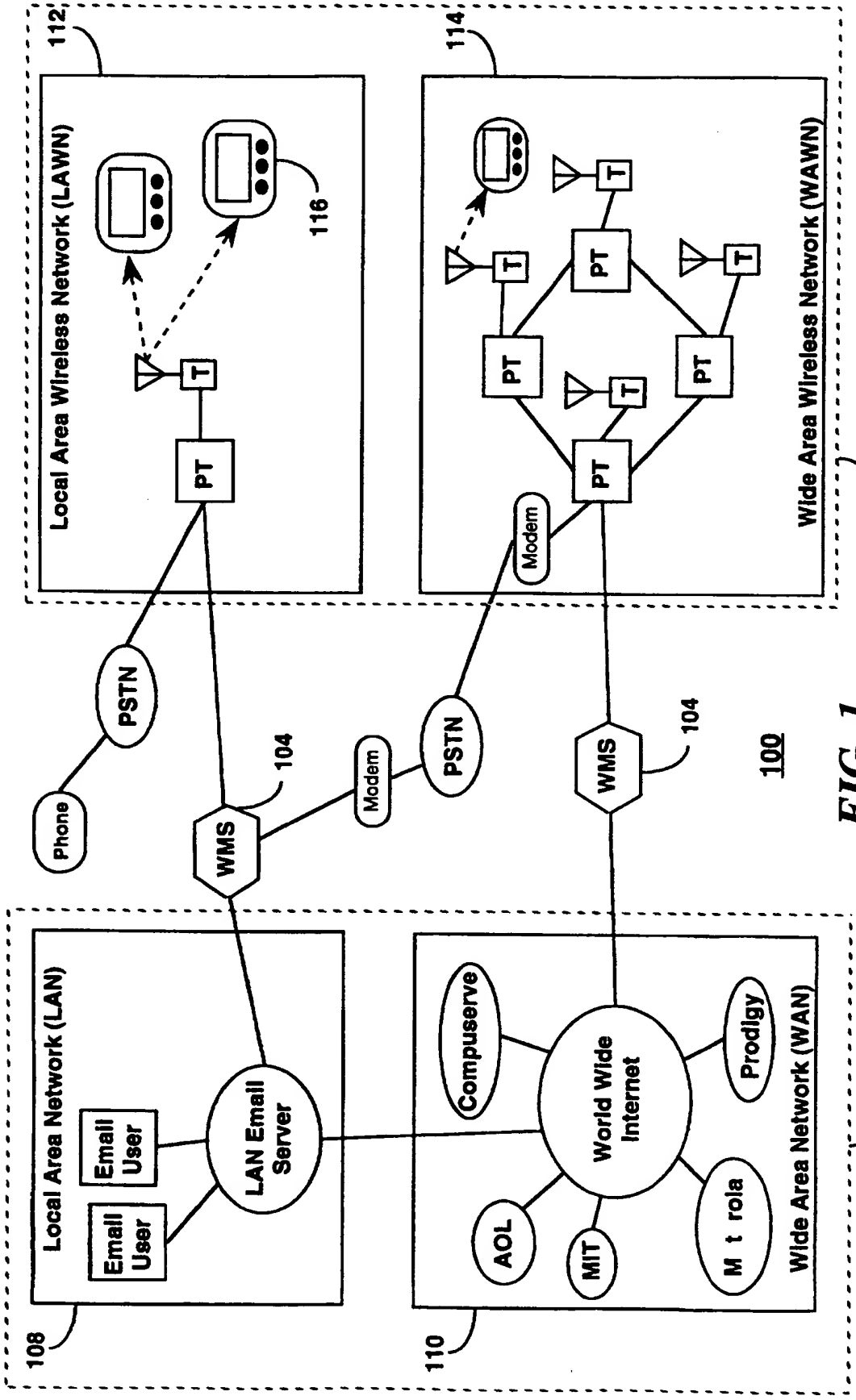
a full user name;

a user name alias;

the wireless messaging unit address; and

the wireless selective call messaging unit identifier.

36. The wireless messaging system of claim 35, wherein the unique user comprises a predetermined list of wireless messaging users comprising a user group.


Local Area Network (LAN)
Email User
Email User
LAN Email Server
108
Wide Area Network (WAN)
Compuserve
World Wide Internet
Prodigy
AOL
MIT
M t rola
110
102
Local Area Wireless Network (LAWN)
T
PT
116
112
Wide Area Wireless Network (WAWN)
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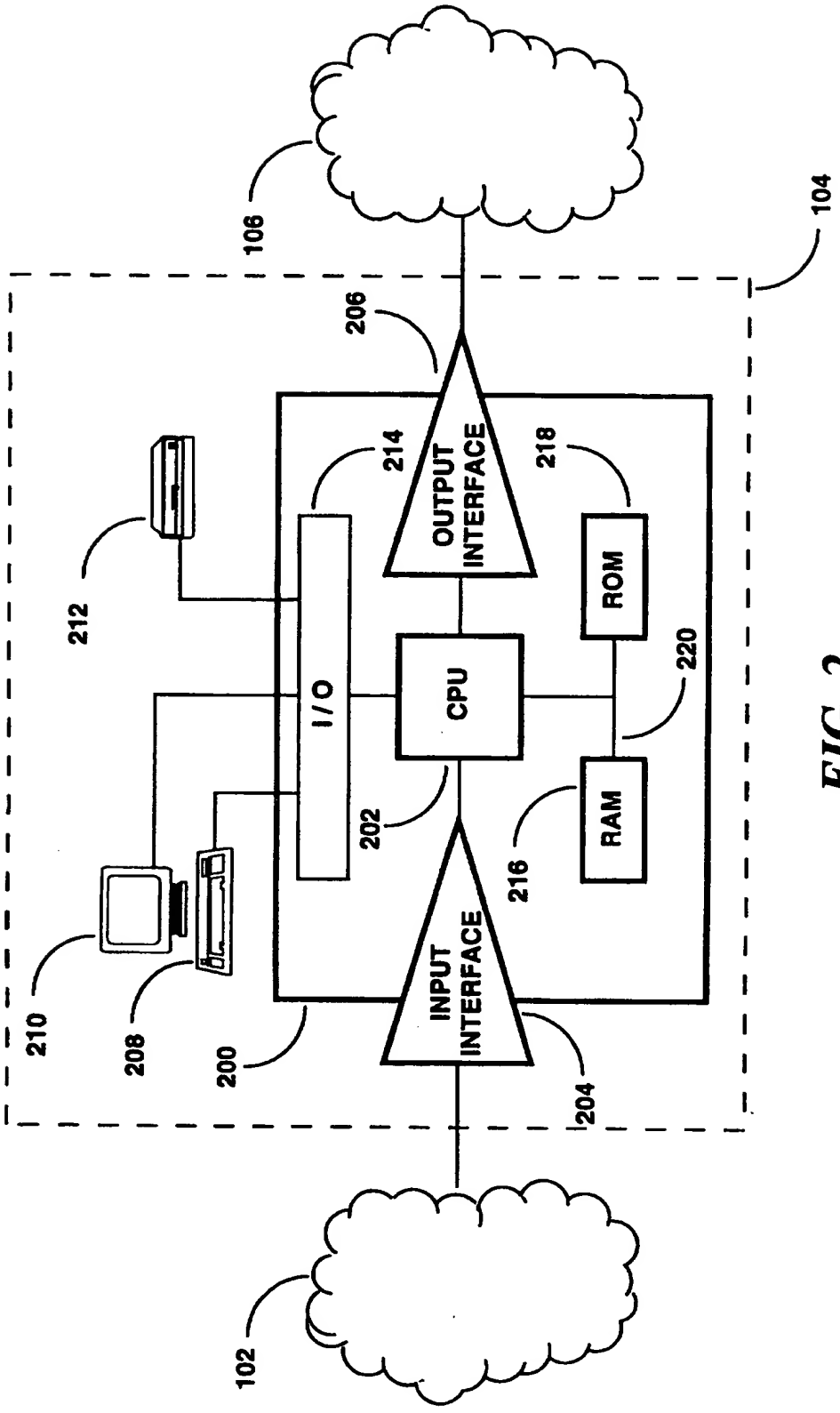
106
Phone
PSTN
WMS
104
Modem
PSTN
WMS
104
100

FIG. 1


106
104
206
OUTPUT INTERFACE
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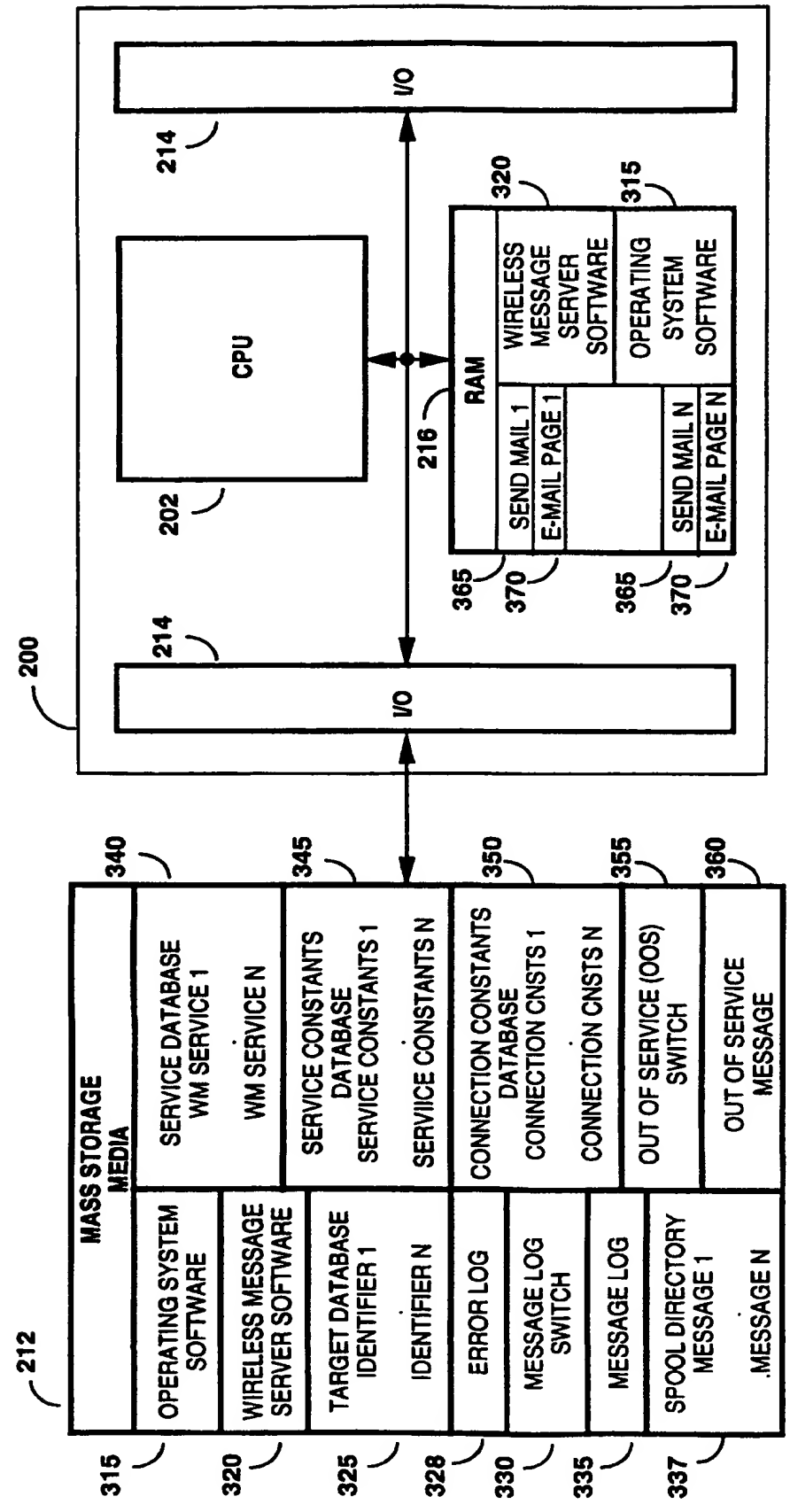
218
ROM
212
I/O
CPU
220
202
RAM
216
INPUT INTERFACE
210
208
200
204
102

FIG. 2


200
214
I/O
214
I/O
202
CPU
216
RAM
320
WIRELESS MESSAGE SERVER SOFTWARE
315
OPERATING SYSTEM SOFTWARE
SEND MAIL 1
E-MAIL PAGE 1
SEND MAIL N
E-MAIL PAGE N
365
370
365
370
212
MASS STORAGE MEDIA
340
345
350
355
360
OPERATING SYSTEM SOFTWARE
WIRELESS MESSAGE SERVER SOFTWARE
TARGET DATABASE IDENTIFIER 1
IDENTIFIER N
ERROR LOG
MESSAGE LOG SWITCH
MESSAGE LOG
SPOOL DIRECTORY MESSAGE 1
MESSAGE N
SERVICE DATABASE WM SERVICE 1
WM SERVICE N
SERVICE CONSTANTS DATABASE
SERVICE CONSTANTS 1
SERVICE CONSTANTS N
CONNECTION CONSTANTS DATABASE
CONNECTION CNSTS 1
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OUT OF SERVICE (OOS) SWITCH
OUT OF SERVICE MESSAGE
315
320
325
328
330
335
337

FIG. 3

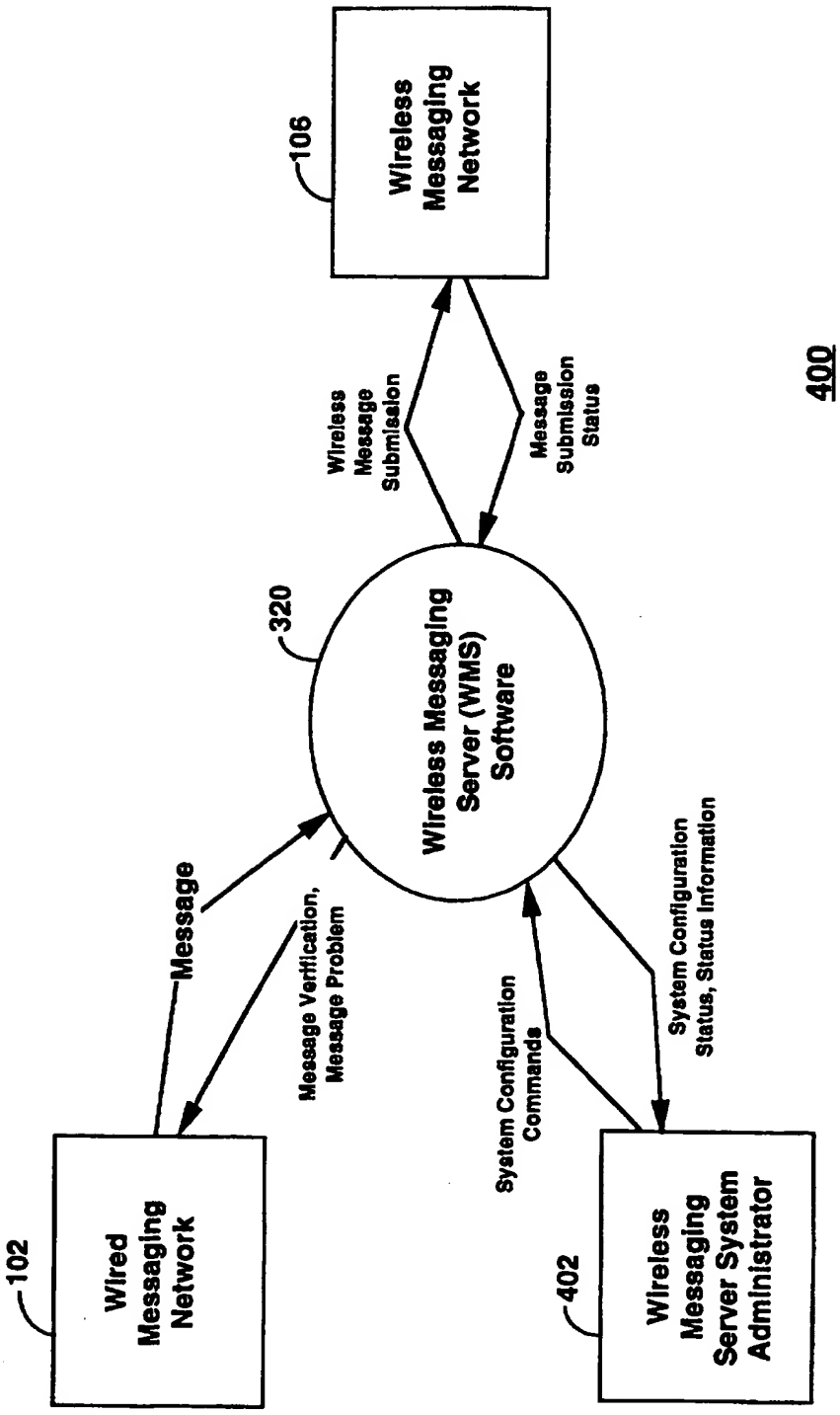

Wireless Messaging Network
106
Wireless Message Submission
Message Submission Status
Wireless Messaging Server (WMS) Software
320
Message
Message Verification, Message Problem
System Configuration Commands
System Configuration Status, Status Information
Wired Messaging Network
102
Wireless Messaging Server System Administrator
402
400

FIG. 4

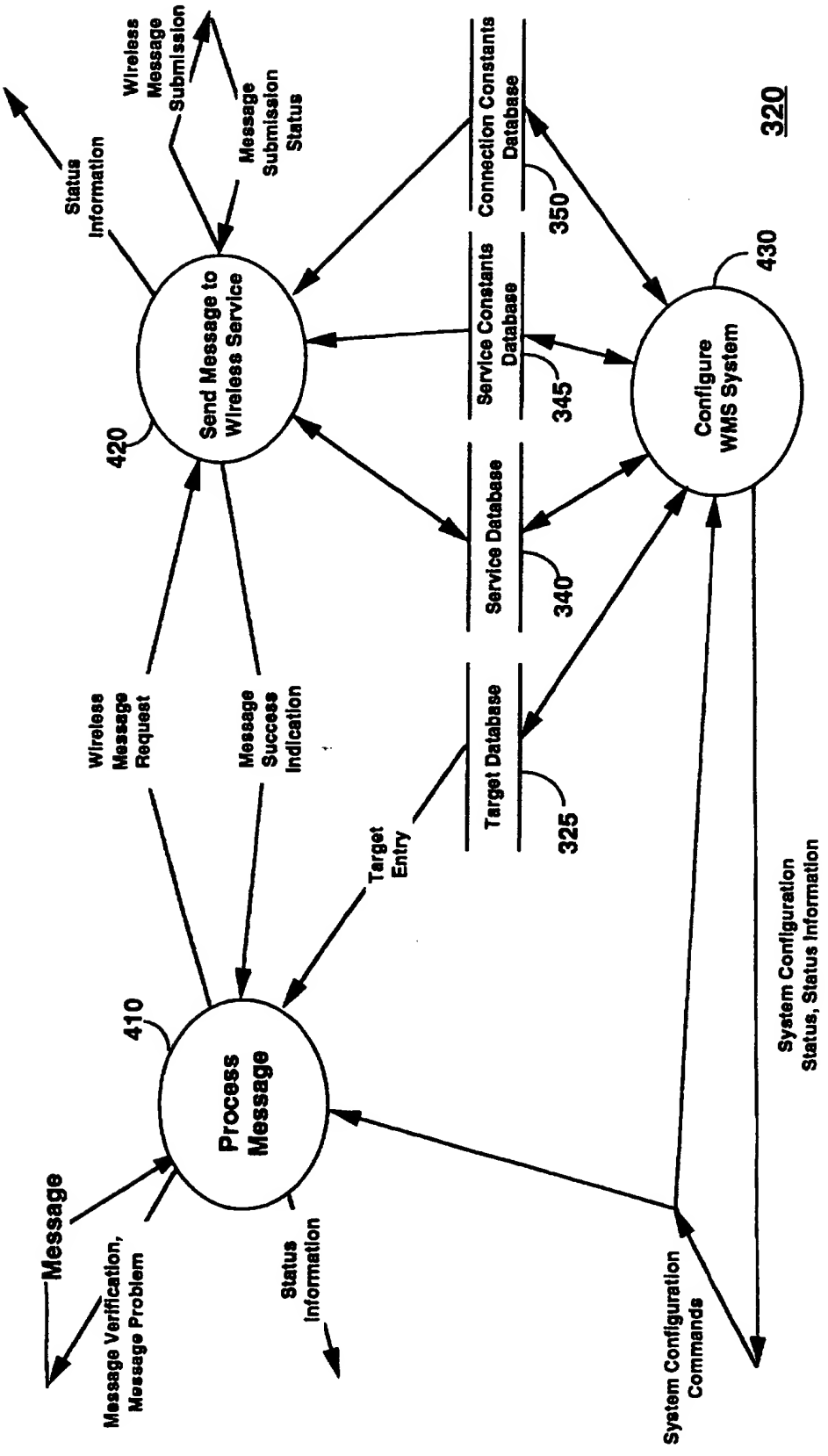

Message
Message Verification, Message Problem
Process Message
410
Status Information
Wireless Message Request
Message Success Indication
Target Entry
Target Database
325
Service Database
340
Service Constants Database
345
Connection Constants Database
350
Send Message to Wireless Service
420
Status Information
Wireless Message Submission
Message Submission Status
Configure WMS System
430
320
System Configuration Commands
System Configuration Status, Status Information

FIG. 5

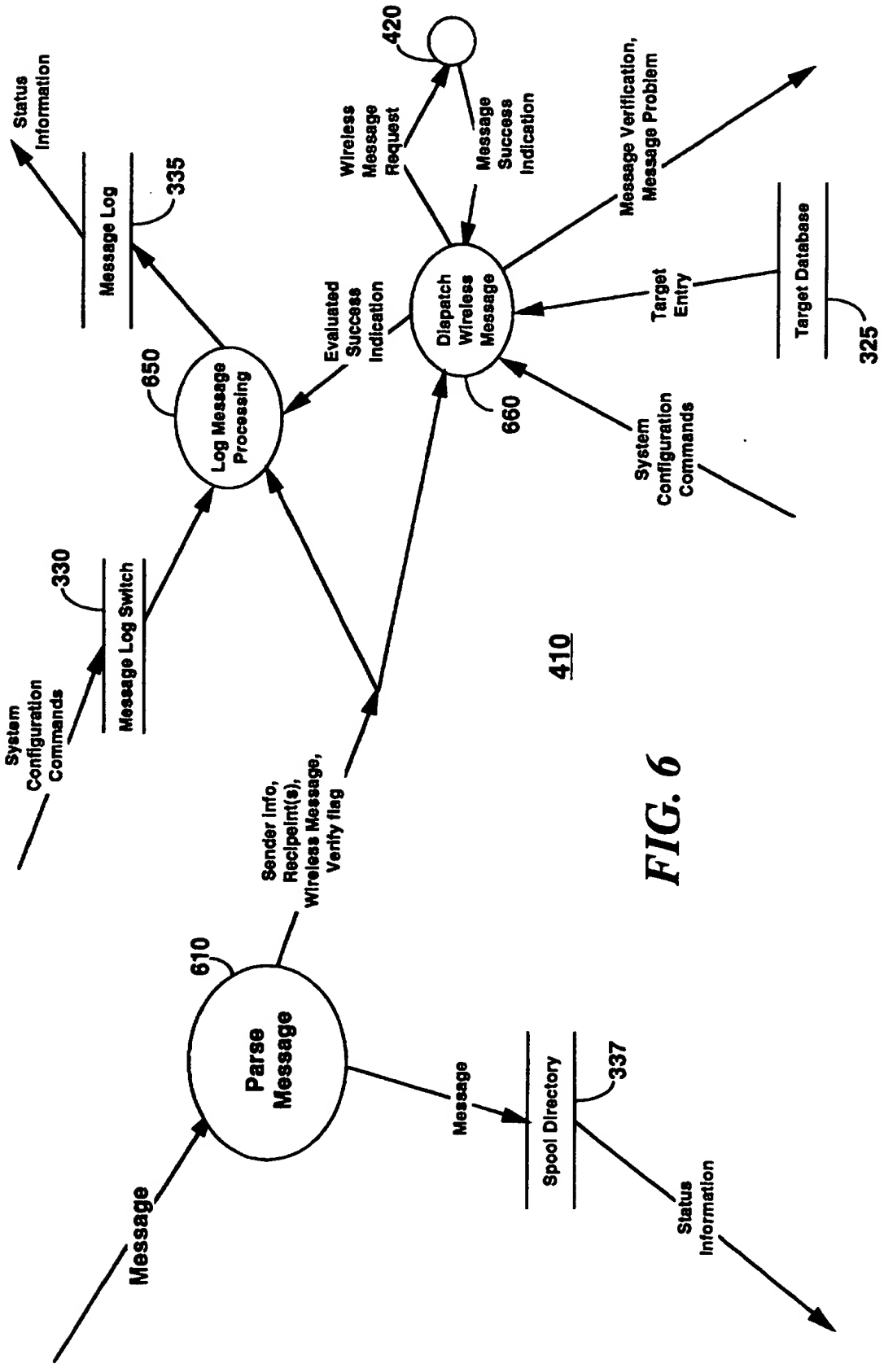

Message
Parse Message
610
Sender Info, Recipient(s), Wireless Message, Verify flag
Message
Spool Directory
337
Status Information
System Configuration Commands
Message Log Switch
330
Log Message Processing
650
Status Information
Message Log
335
Evaluated Success Indication
Dispatch Wireless Message
660
Wireless Message Request
Message Success Indication
420
Message Verification, Message Problem
Target Entry
Target Database
325
System Configuration Commands
410

FIG. 6

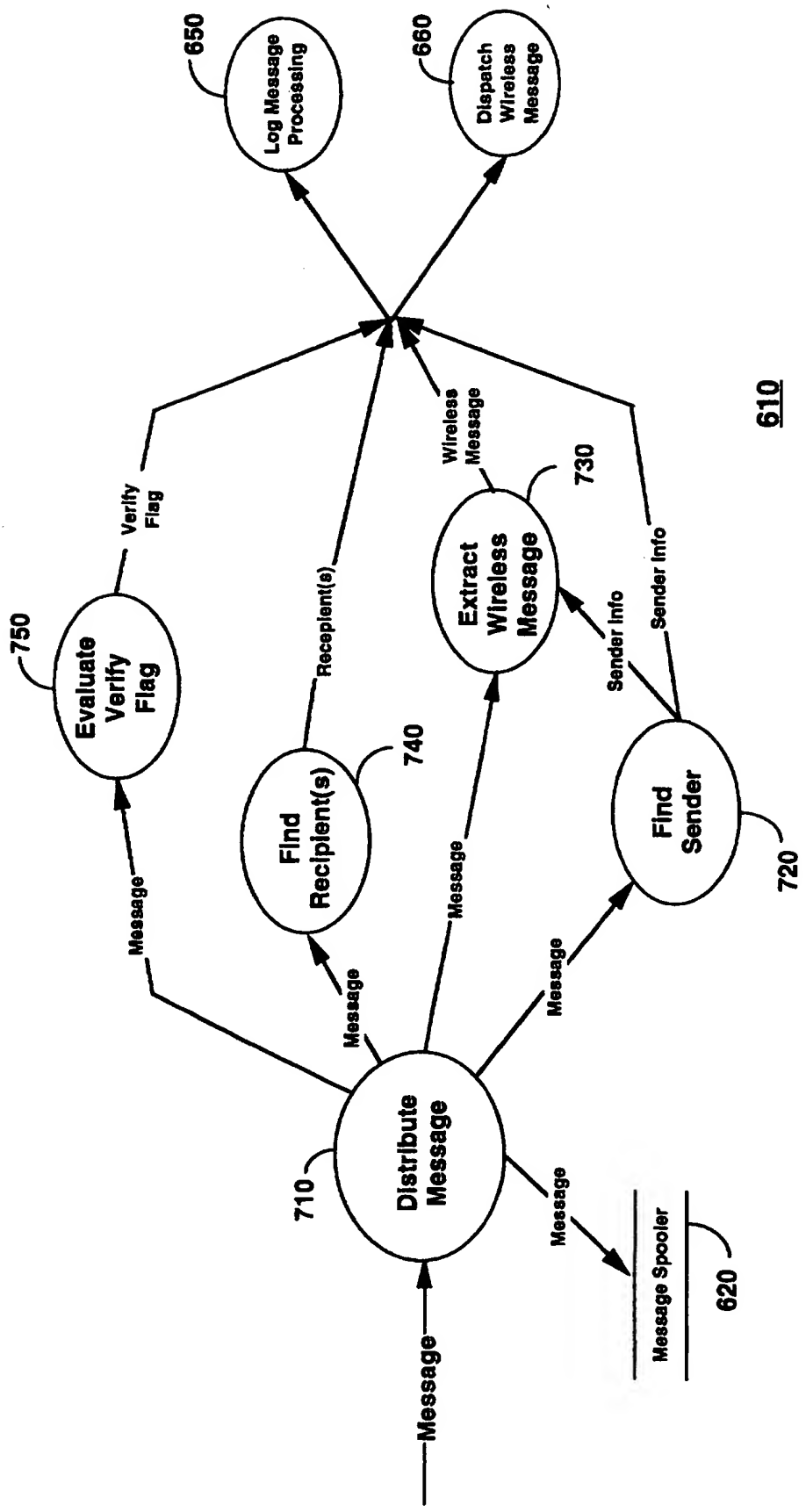

650
Log Message Processing
660
Dispatch Wireless Message
Verify Flag
Recipient(s)
Wireless Message
730
Extract Wireless Message
Sender Info
Sender Info
750
Evaluate Verify Flag
740
Find Recipient(s)
Find Sender
720
610
Message
Message
Message
Message
Message
710
Distribute Message
Message
Message Spooler
620
Message

FIG. 7

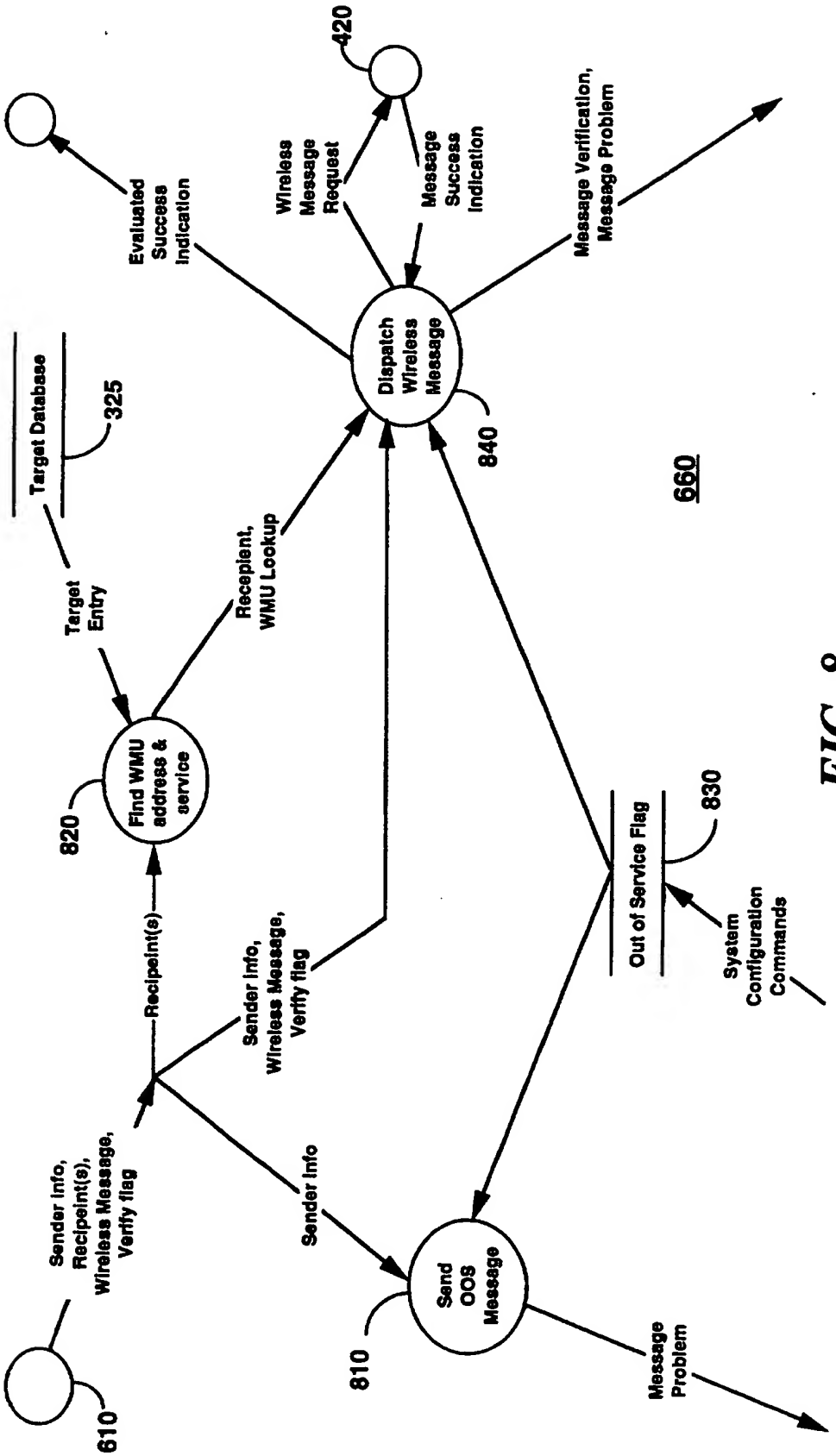
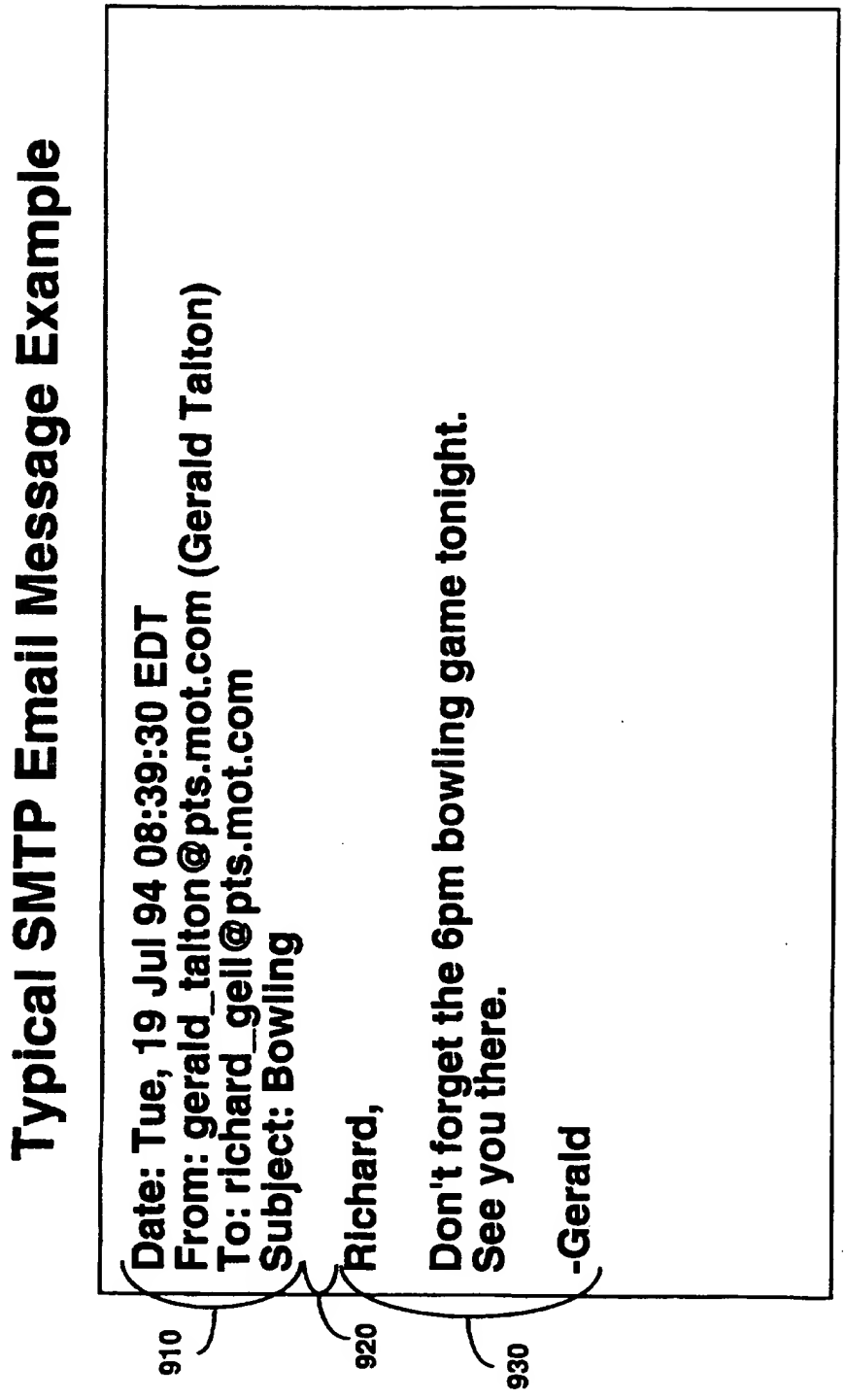

420
Evaluated Success Indication
Wireless Message Request
Message Success Indication
Message Verification, Message Problem
Target Database
325
Dispatch Wireless Message
840
660
Target Entry
Recipient, WMU Lookup
Find WMU address & service
820
Recipient(s)
Sender Info, Wireless Message, Verify flag
Out of Service Flag
830
System Configuration Commands
Sender Info, Recipient(s), Wireless Message, Verify flag
Sender Info
Send OOS Message
810
Message Problem
610

FIG. 8



PRIOR ART

FIG. 9

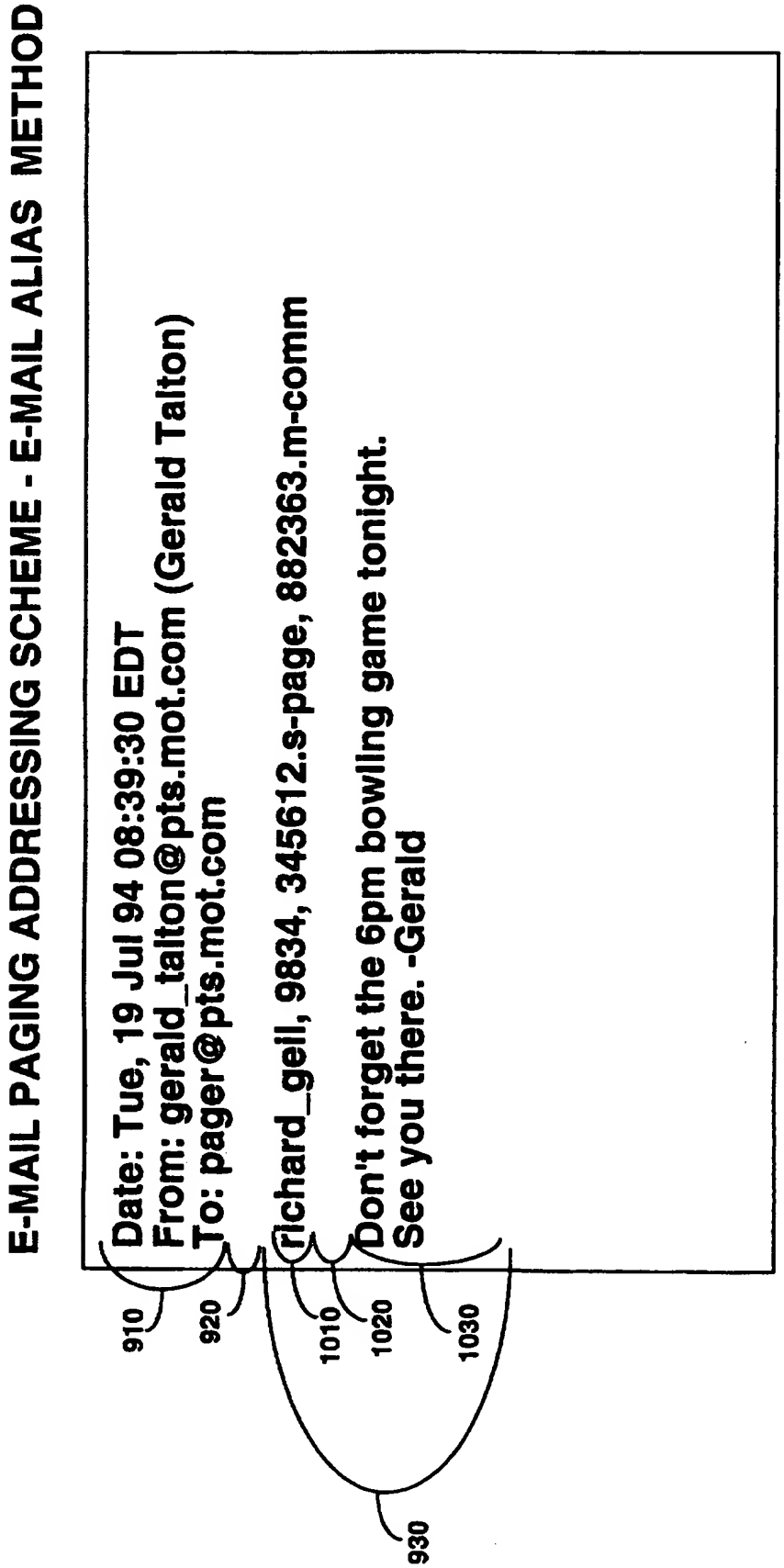

E-MAIL PAGING ADDRESSING SCHEME - E-MAIL ALIAS METHOD
Date: Tue, 19 Jul 94 08:39:30 EDT
From: gerald_talton@pts.mot.com (Gerald Talton)
To: pager@pts.mot.com
richard_gell, 9834, 345612.s-page, 882363.m-comm
Don't forget the 6pm bowling game tonight.
See you there. -Gerald
910
920
1010
1020
1030
930

FIG. 10

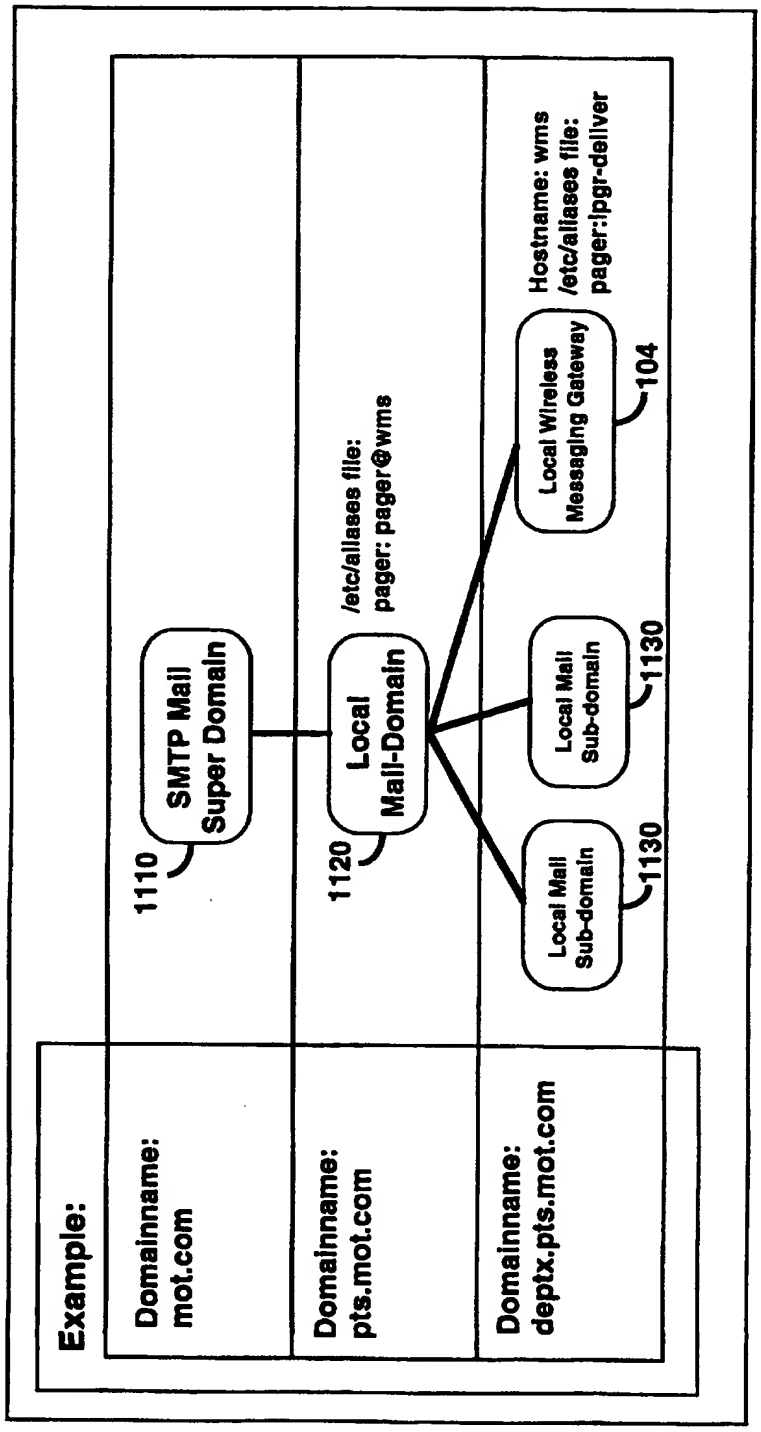

E-MAIL ALIAS ADDRESSING - MAIL CONFIGURATION CONTEXT
Example:
Domainname: mot.com
Domainname: pts.mot.com
Domainname: deptx.pts.mot.com
1110
SMTP Mail Super Domain
1120
Local Mail-Domain
/etc/aliases file: pager: pager@wms
Local Mail Sub-domain
1130
Local Mail Sub-domain
1130
Local Wireless Messaging Gateway
104
Hostname: wms /etc/aliases file: pager:|pgr-deliver

FIG. 11

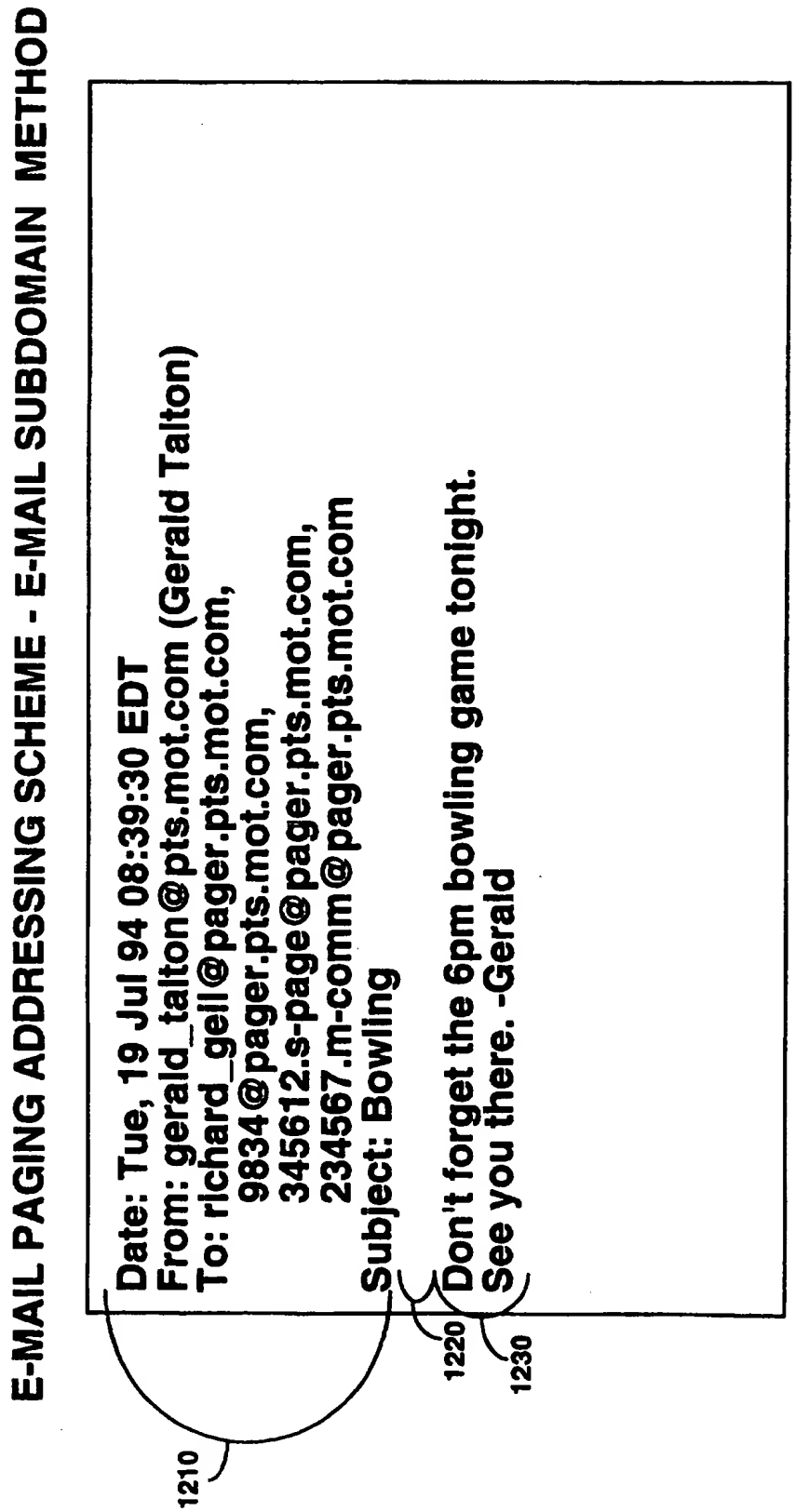

E-MAIL PAGING ADDRESSING SCHEME - E-MAIL SUBDOMAIN METHOD
Date: Tue, 19 Jul 94 08:39:30 EDT
From: gerald_talton@pts.mot.com (Gerald Talton)
To: richard_gell@pager.pts.mot.com,
9834@pager.pts.mot.com,
345612.s-page@pager.pts.mot.com,
234567.m-comm@pager.pts.mot.com
Subject: Bowling
Don't forget the 6pm bowling game tonight.
See you there. -Gerald
1210
1220
1230

FIG. 12

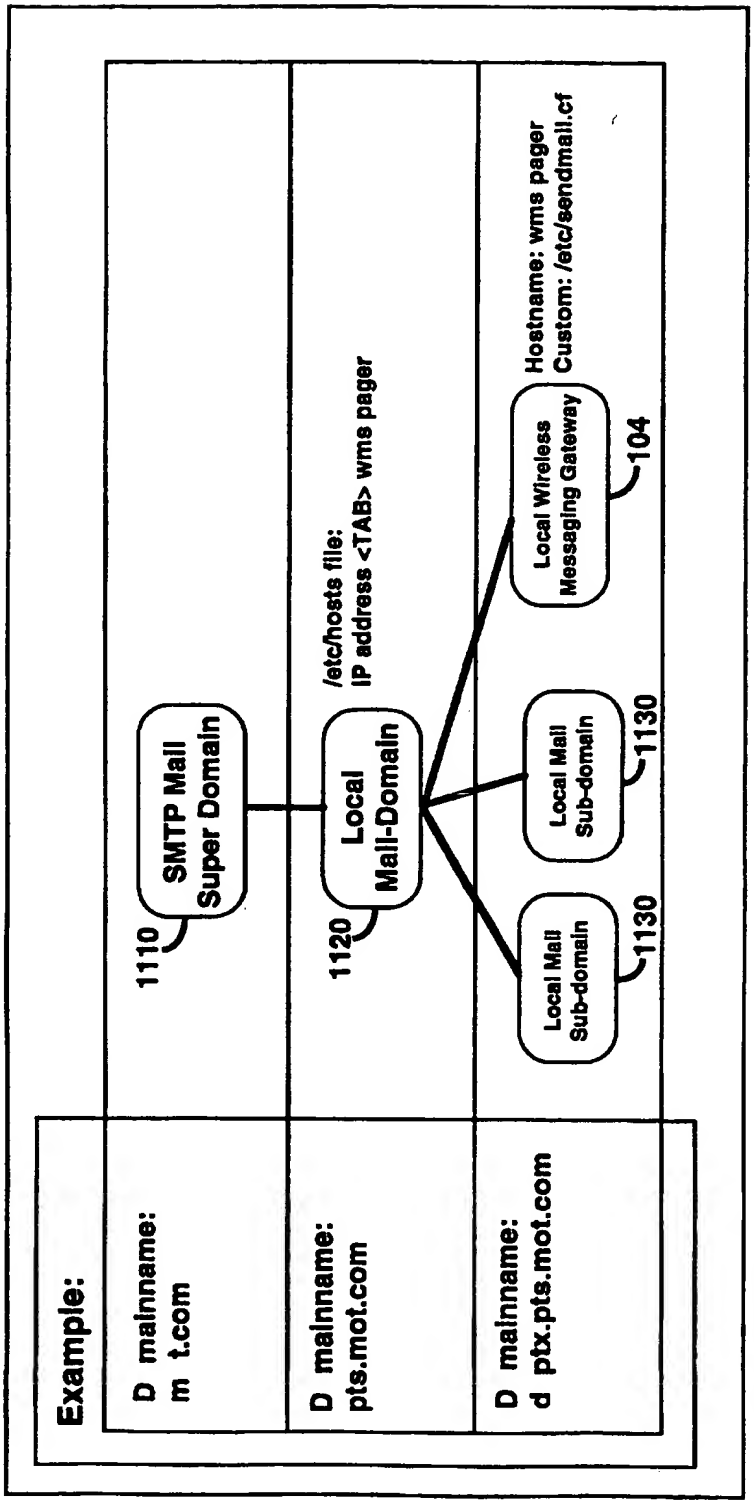

E-MAIL ALIAS ADDRESSING - MAIL CONFIGURATION CONTEXT
Example:
D mainname:
m t.com
D mainname:
pts.mot.com
D mainname:
d ptx.pts.mot.com
1110
SMTP Mail
Super Domain
1120
Local
Mail-Domain
/etc/hosts file:
IP address <TAB> wms pager
Local Mail
Sub-domain
1130
Local Mail
Sub-domain
1130
Local Wireless
Messaging Gateway
104
Hostname: wms pager
Custom: /etc/sendmail.cf

FIG. 13

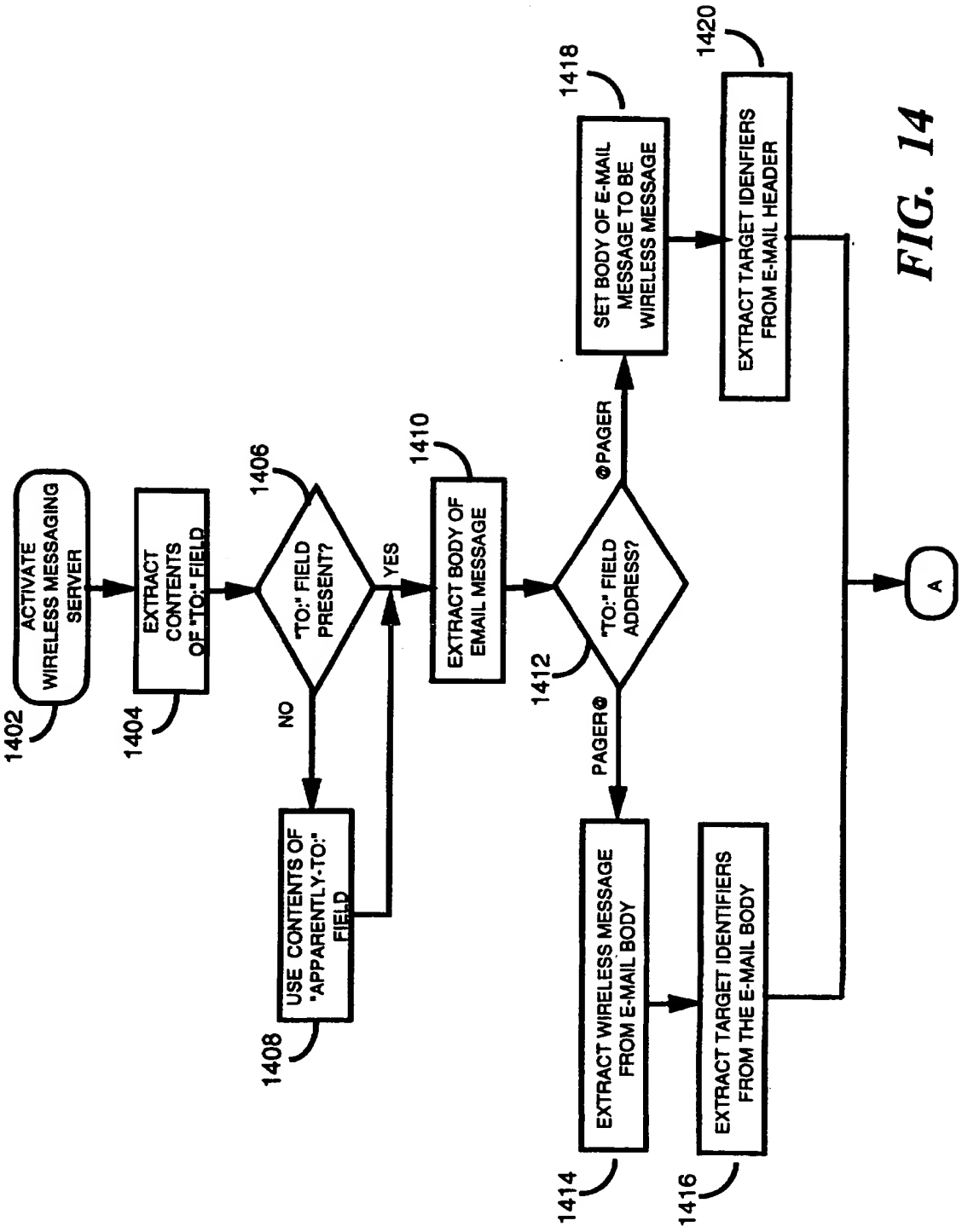

ACTIVATE WIRELESS MESSAGING SERVER
1402
EXTRACT CONTENTS OF "TO:" FIELD
1404
"TO:" FIELD PRESENT?
1406
YES
NO
USE CONTENTS OF "APPARENTLY-TO:" FIELD
1408
EXTRACT BODY OF EMAIL MESSAGE
1410
"TO:" FIELD ADDRESS?
1412
@PAGER
PAGER@
SET BODY OF E-MAIL MESSAGE TO BE WIRELESS MESSAGE
1418
EXTRACT TARGET IDENFIERS FROM E-MAIL HEADER
1420
EXTRACT WIRELESS MESSAGE FROM E-MAIL BODY
1414
EXTRACT TARGET IDENTIFIERS FROM THE E-MAIL BODY
1416
A

FIG. 14

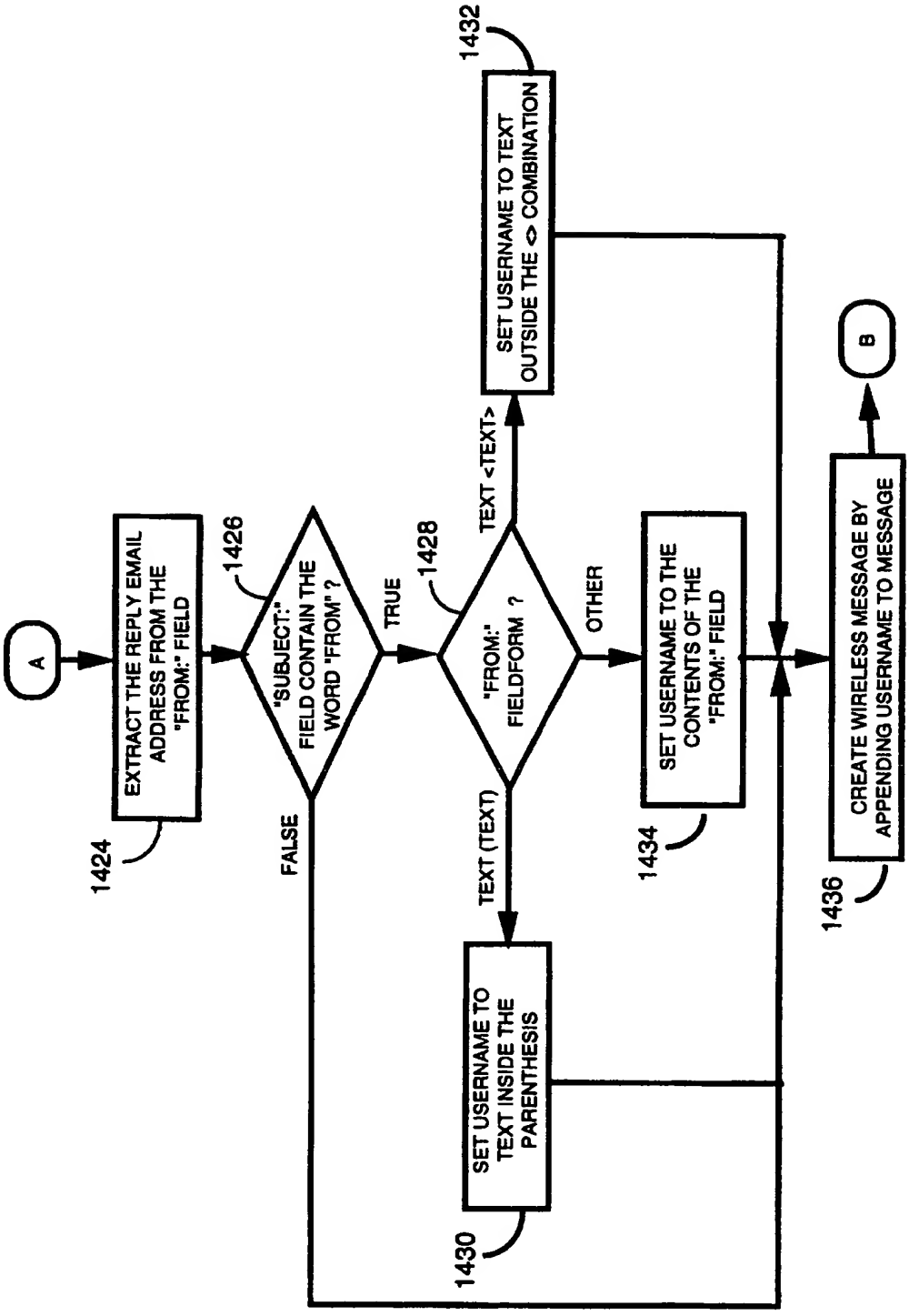

A
EXTRACT THE REPLY EMAIL ADDRESS FROM THE "FROM:" FIELD
1424
"SUBJECT:" FIELD CONTAIN THE WORD "FROM" ?
1426
FALSE
TRUE
"FROM:" FIELDFORM ?
1428
TEXT <TEXT>
SET USERNAME TO TEXT OUTSIDE THE <> COMBINATION
1432
OTHER
SET USERNAME TO THE CONTENTS OF THE "FROM:" FIELD
1434
TEXT (TEXT)
SET USERNAME TO TEXT INSIDE THE PARENTHESIS
1430
CREATE WIRELESS MESSAGE BY APPENDING USERNAME TO MESSAGE
1436
B

FIG. 15

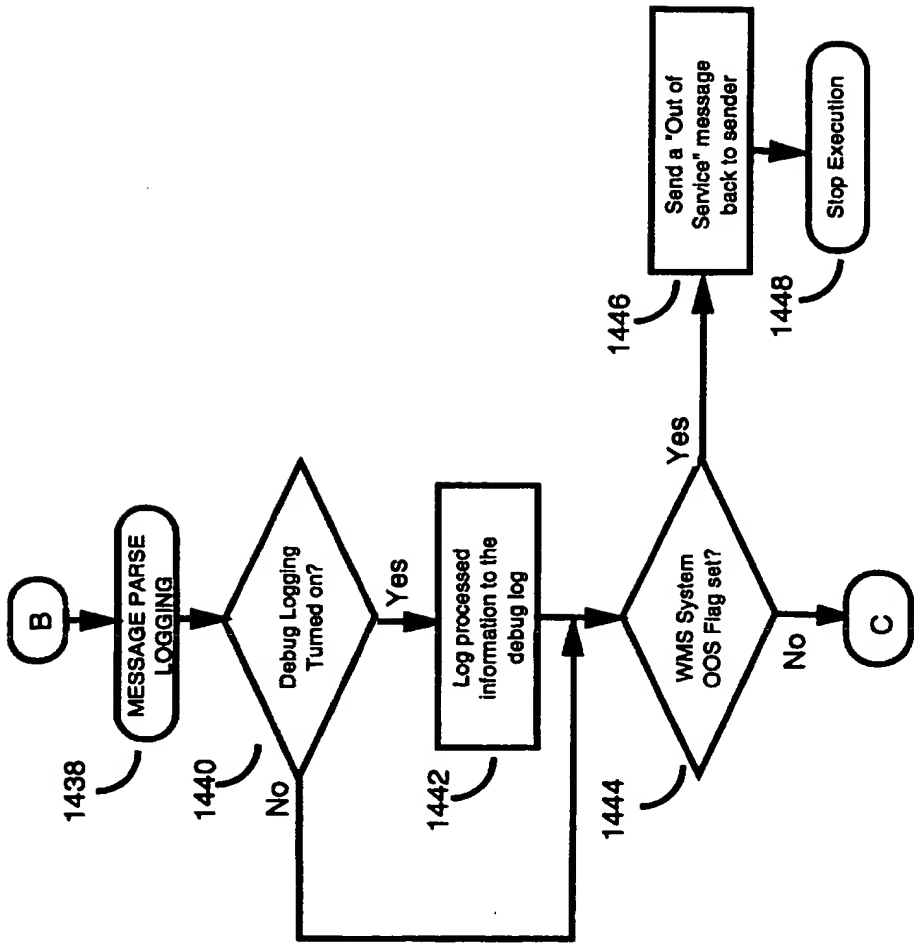

B
MESSAGE PARSE LOGGING
1438
Debug Logging Turned on?
1440
Yes
No
Log processed information to the debug log
1442
WMS System OOS Flag set?
1444
Yes
No
C
Send a "Out of Service" message back to sender
1446
Stop Execution
1448

FIG. 16

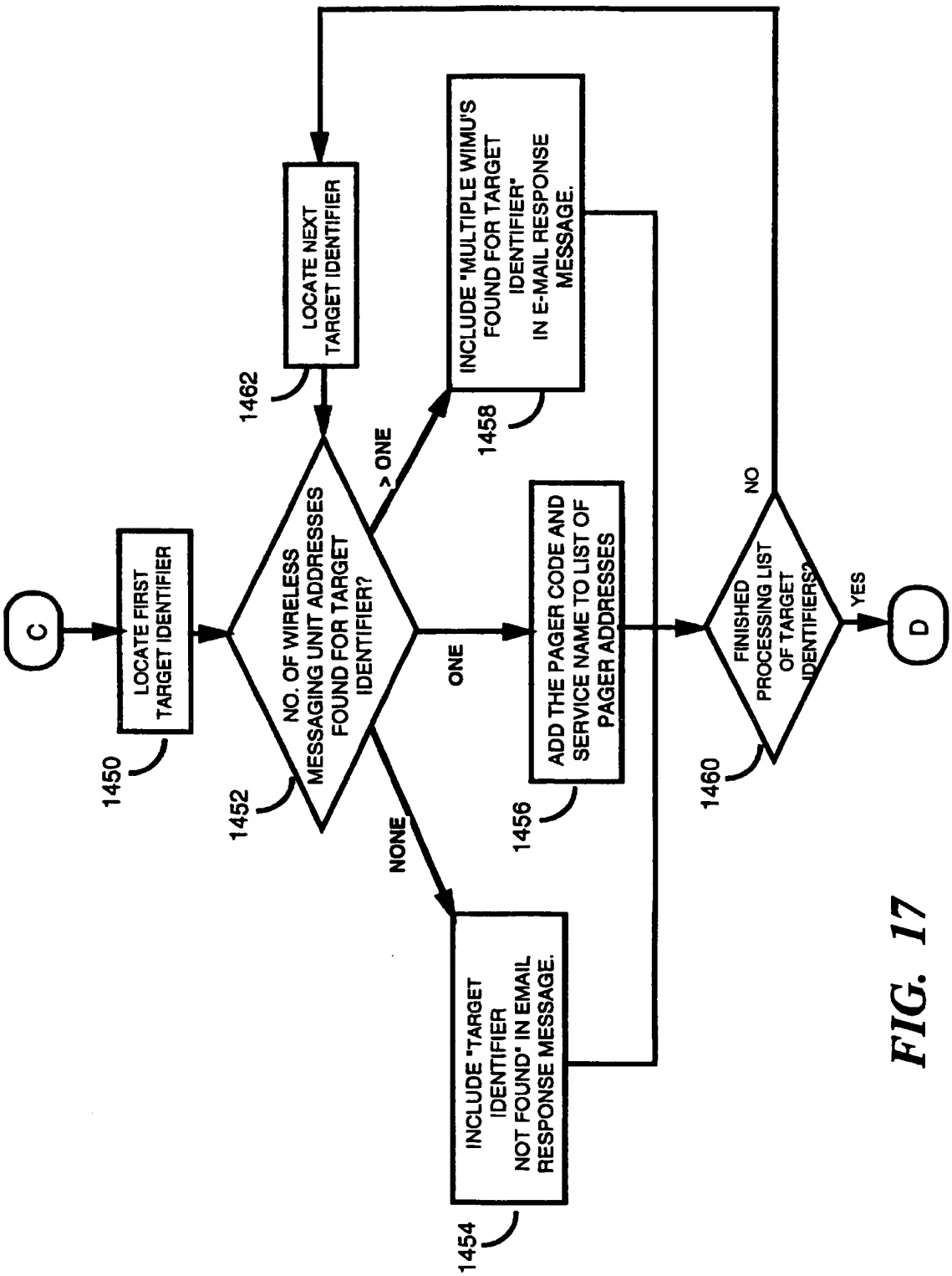

C
LOCATE FIRST TARGET IDENTIFIER
1450
NO. OF WIRELESS MESSAGING UNIT ADDRESSES FOUND FOR TARGET IDENTIFIER?
1452
> ONE
ONE
NONE
LOCATE NEXT TARGET IDENTIFIER
1462
INCLUDE "MULTIPLE WIMU'S FOUND FOR TARGET IDENTIFIER" IN E-MAIL RESPONSE MESSAGE.
1458
ADD THE PAGER CODE AND SERVICE NAME TO LIST OF PAGER ADDRESSES
1456
INCLUDE "TARGET IDENTIFIER NOT FOUND" IN EMAIL RESPONSE MESSAGE.
1454
FINISHED PROCESSING LIST OF TARGET IDENTIFIERS?
1460
NO
YES
D

FIG. 17

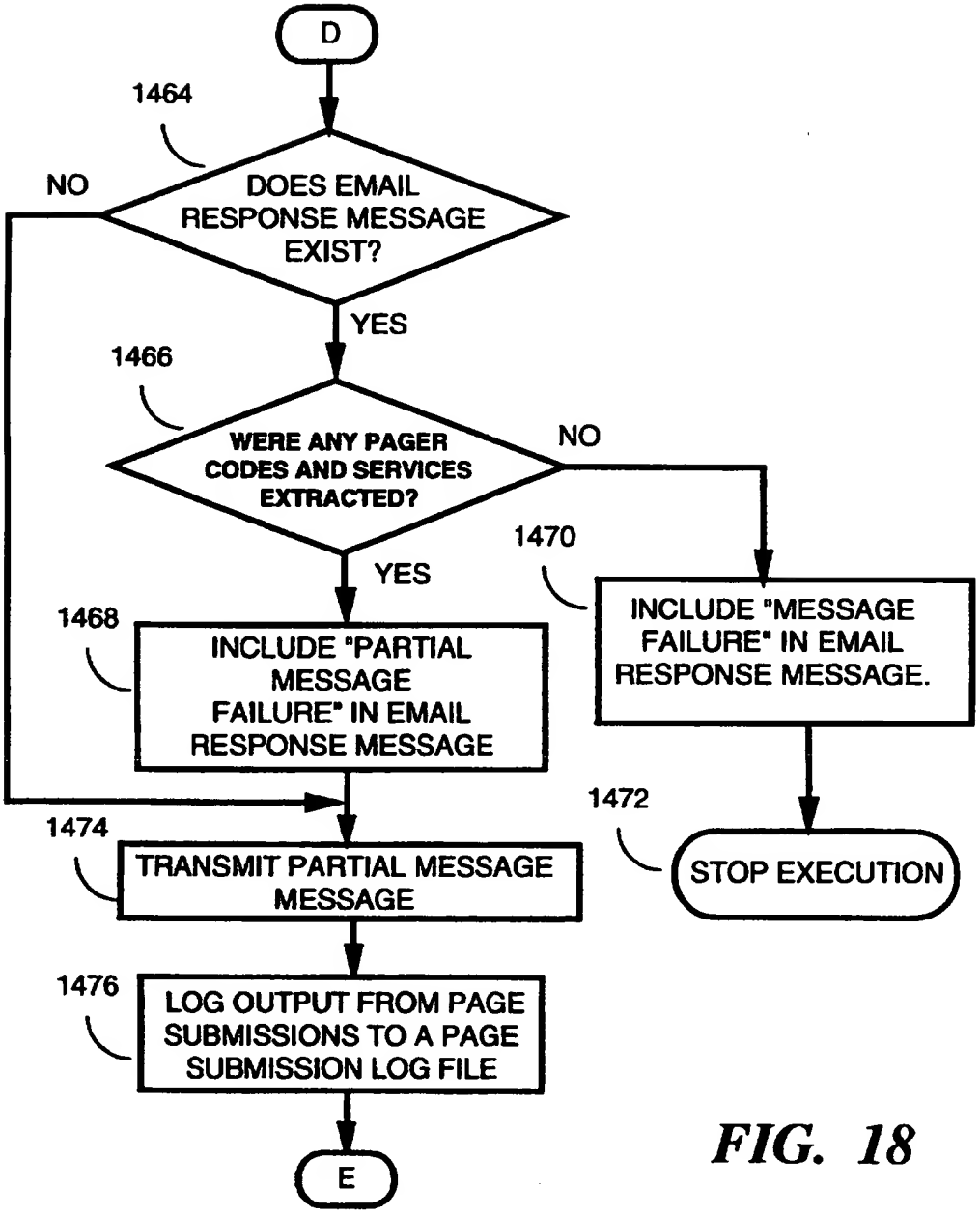

D
1464
DOES EMAIL RESPONSE MESSAGE EXIST?
NO
YES
1466
WERE ANY PAGER CODES AND SERVICES EXTRACTED?
NO
YES
1470
INCLUDE "MESSAGE FAILURE" IN EMAIL RESPONSE MESSAGE.
1468
INCLUDE "PARTIAL MESSAGE FAILURE" IN EMAIL RESPONSE MESSAGE
1472
STOP EXECUTION
1474
TRANSMIT PARTIAL MESSAGE MESSAGE
1476
LOG OUTPUT FROM PAGE SUBMISSIONS TO A PAGE SUBMISSION LOG FILE
E

FIG. 18

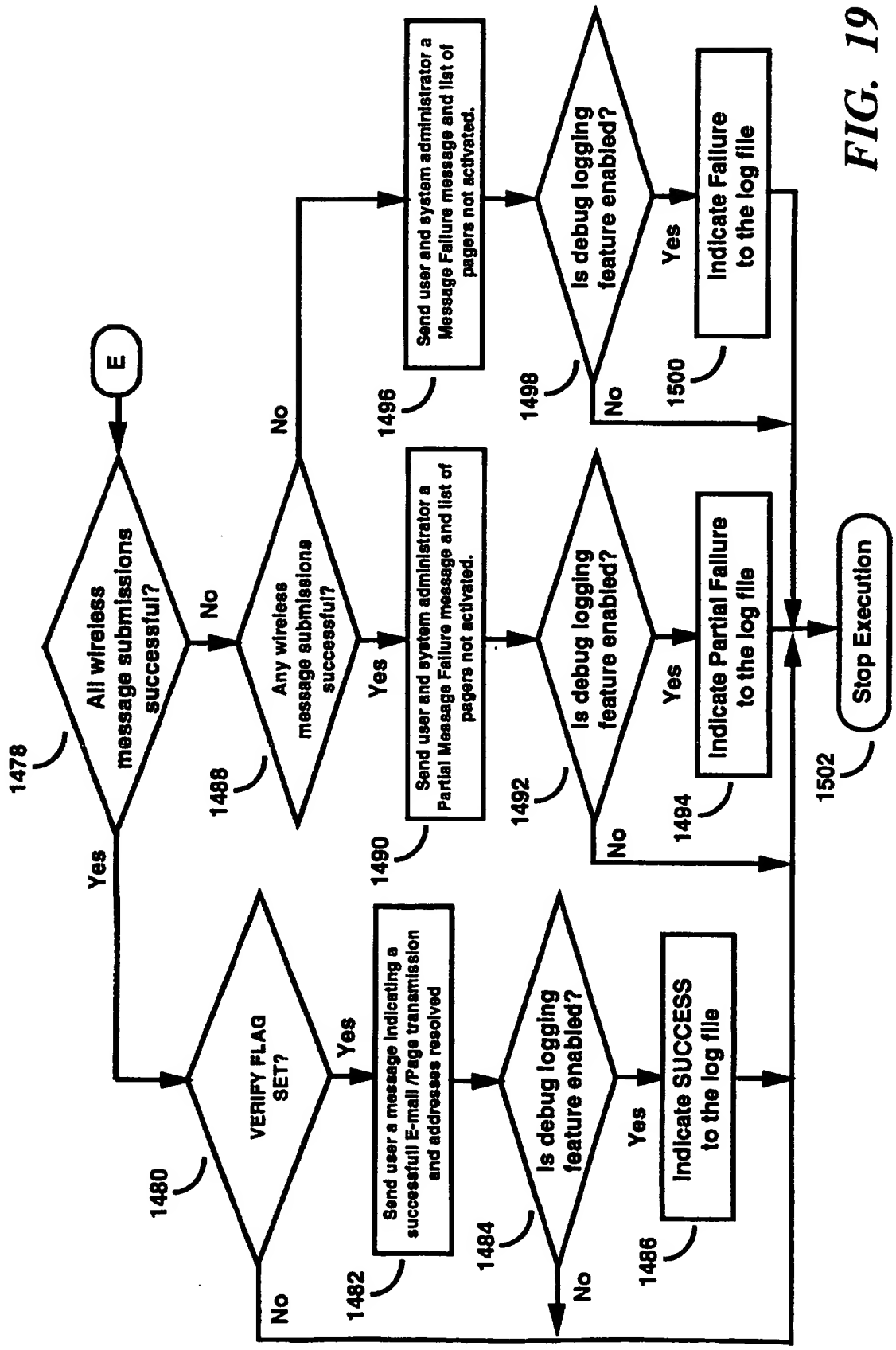

E
All wireless message submissions successful?
1478
Yes
No
Any wireless message submissions successful?
1488
Yes
No
Send user and system administrator a Partial Message Failure message and list of pagers not activated.
1490
Send user and system administrator a Message Failure message and list of pagers not activated.
1496
Is debug logging feature enabled?
1492
Yes
No
Indicate Partial Failure to the log file
1494
Is debug logging feature enabled?
1498
Yes
No
Indicate Failure to the log file
1500
VERIFY FLAG SET?
1480
Yes
No
Send user a message indicating a successfull E-mail /Page tranamission and addresses resolved
1482
Is debug logging feature enabled?
1484
Yes
No
Indicate SUCCESS to the log file
1486
Stop Execution
1502

FIG. 19

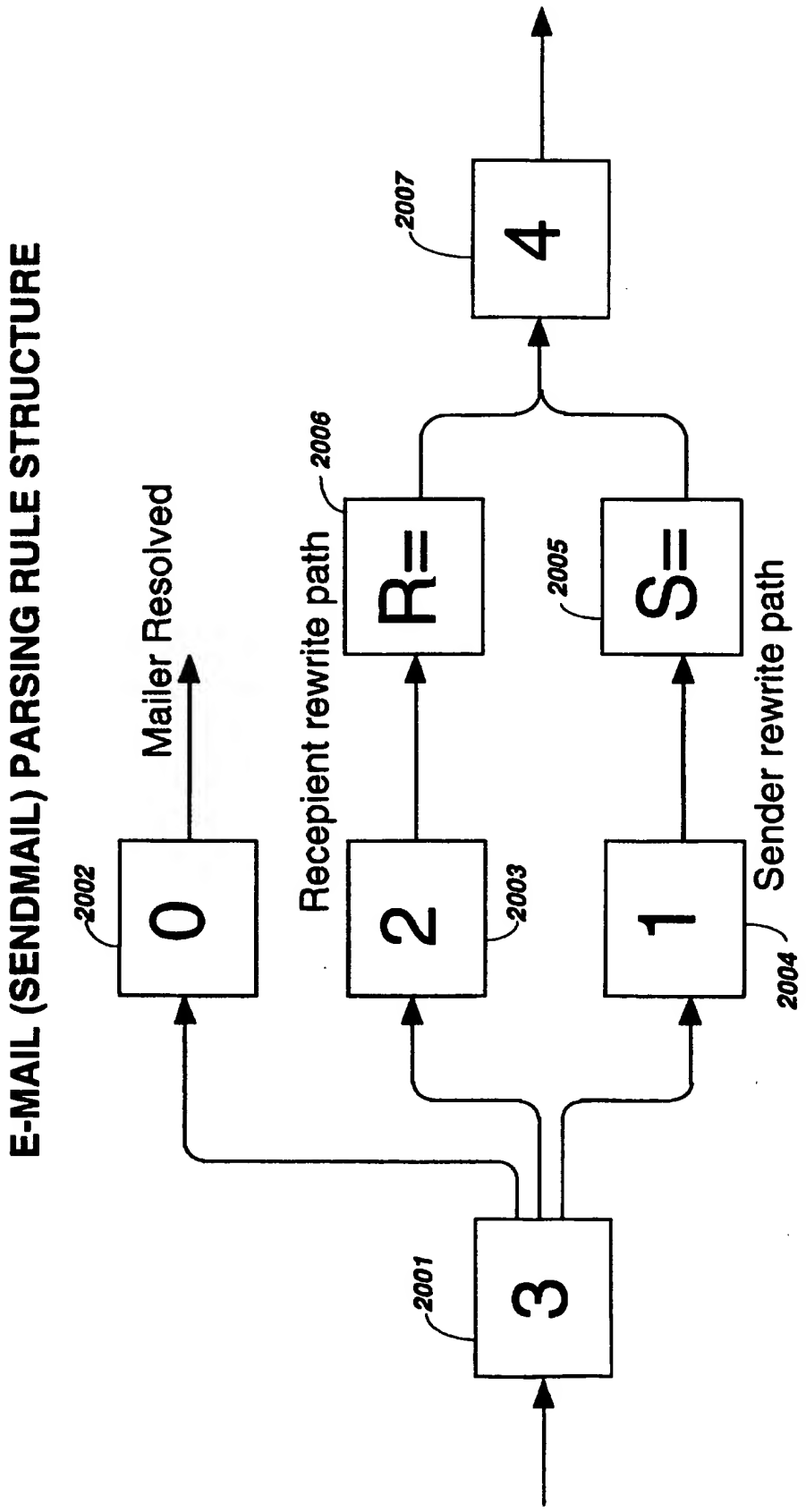

E-MAIL (SENDMAIL) PARSING RULE STRUCTURE
3
2001
0
2002
Mailer Resolved
2
2003
Recepient rewrite path
R=
2006
1
2004
Sender rewrite path
S=
2005
4
2007

FIG. 20

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/00670

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :G08B 5/22; H04Q 7/00; H04M 11/00
US CL :340/825.44; 455/33.2; 379/57
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 340/825.44, 825.07, 825.33, 825.34, 825.5, 825.52; 455/33.2, 56.1, 54.1, 33.1, 38.2; 379/57, 59, 60

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS- SEARCH TERMS: PAGER OR SELECT? CALL? OR PAGING RECEIVER, E-MAIL, WIRELESS MESSAGING, WIRELESS MESSAGING SYSTEM, WIRELESS MESSAGING NETWORK, WIRELESS MESSAGING SERVER

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 5,436,960 (CAMPANA, JR. ET AL.) 25 JULY 1995, ABSTRACT, COL. 4, LINES 45-51, COL. 5 LINES 17-35, COL. 7 LINES 20-32, COL. 11, LINES 48-56, COL. 16 LINE 66- COL.17, LINE 14, COL. 19, LINES 11-19, COL. 24, LINES 49-57, COL. 25, LINES 4-16, 36-42, AND 64-68, COL. 26, LINES 1-14, 29-42, AND 64-68, COL. 27 LINE 24- COL. 28, LINE 62.	1-36
A, T	US, A, 5,604,788 (TETT) 18 FEBRUARY 1997, ABSTRACT.	1
A, T	US, A, 5,612,682 (DELUCA ET AL.) 18 MARCH 1997, ABSTRACT.	1
A, P	US, A, 5,550,861 (CHAN ET AL.) 27 AUGUST 1996, COL. 3, LINES 25-31.	1

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 19 MAY 1997	Date of mailing of the international search report 11 JUN 1997
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3603	Authorized officer EDWARD MERZ Telephone No. (703) 305-4869

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/00670

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A, T	US, A, 5,621,798 (AUCSMITH) 15 APRIL 1997 COL. 1, LINES 13-26, COL. 2, LINES 26-51.	1